

PLAN OF STUDY
FOR THE
WASTEWATER MANAGEMENT PROGRAM
IN THE
BOSTON HARBOR-EASTERN MASSACHUSETTS METROPOLITAN AREA

BY THE

COMMONWEALTH OF MASSACHUSETTS

AND

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

AND

METROPOLITAN DISTRICT COMMISSION

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1. Resolution of the U.S. Senate, March 2, 1972
2. Resolution of the U.S. House of Representatives, June 16, 1972
3. Letter of Agreement between the U.S. Army Corps of Engineers and
the Commonwealth of Massachusetts
4. Letter of Agreement between the Environmental Protection Agency and
the Commonwealth of Massachusetts

BOSTON HARBOR-EASTERN MASSACHUSETTS METROPOLITAN AREA

WASTEWATER MANAGEMENT

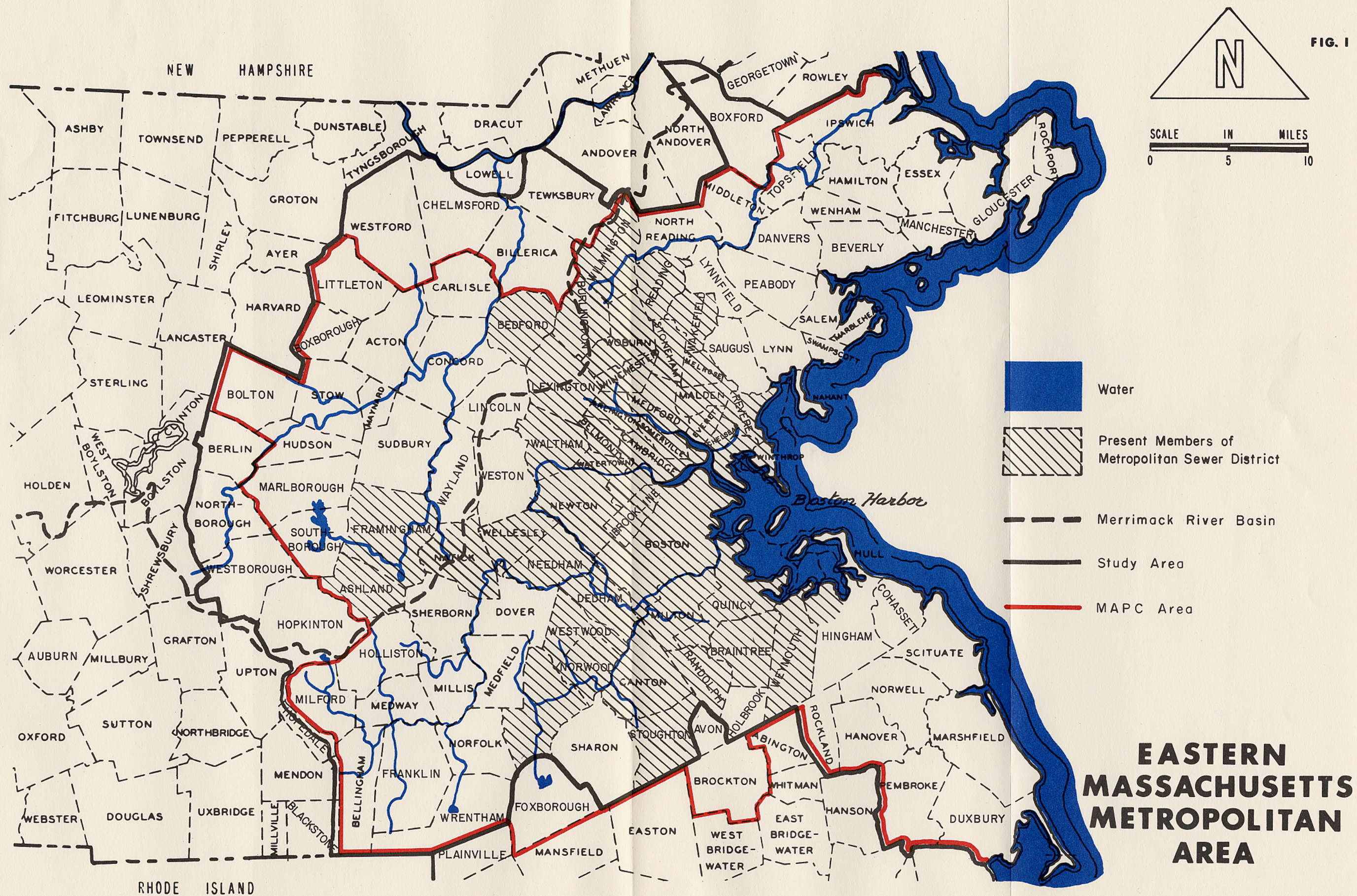
PLAN OF STUDY

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I. SUMMARY

This plan of study sets forth the issues to be addressed in developing a comprehensive wastewater management plan for the Boston Harbor-Eastern Massachusetts Metropolitan Area to meet all foreseeable short and long-term needs for the years 1990, 2020 and 2050. It is to be used as a management tool to assist in orientation, direction, and coordination, as well as to show the interrelationships between the participants within the study. It is intended that it be flexible; undergoing periodic modification as required.

The study will be accomplished as a joint effort by the Metropolitan District Commission, Corps of Engineers, the Commonwealth of Massachusetts Office of State Planning and Management, the Division of Water Pollution Control, the Metropolitan Area Planning Council and the Environmental Protection Agency. The study will take 18 to 30 months and be accomplished in two phases. Phase one beginning 13 Mar 1973 will be completed in 18 months. Phase two will be completed during the next 12 months.

In conducting the study, the Corps of Engineers will be operating under the authority of the Congress of the United States. Within the Congressional resolution, authority was also given for a study in the Merrimack River Basin. The Merrimack study is separate and is addressed in "The Merrimack: Designs for a Clean River Plan of Study", dated January 1973.

The reasons and need for the study, the importance of goals and objectives, the public's role in the planning effort, the types of basic data that will be utilized in formulating alternative wastewater treatment plans which propose varied solutions to the problems of industrial wastes, combined sewer overflows, infiltration and stormwater flows will be discussed. How these plans will be evaluated and the procedures for report preparation, review and approval will also be discussed.

II. INTRODUCTION

A. Background of the Study

The Metropolitan Sewerage District was established in 1889 to build, maintain and operate comprehensive sewerage systems for the Greater Boston area. At the present time, the M.S.D. serves 43 cities and towns in Metropolitan Boston.

In 1952, the Nut Island Sewage Treatment Plant was constructed to provide primary treatment and disinfection of sewerage for western and southern tributary towns. In 1968, a similar facility went into operation at Deer Island to serve northern metropolitan communities. The M.D.C. pollution abatement program, initiated some thirty years ago, is still continuing and includes relief sewers on the north and south sides of the Charles River and a recently completed 4.6 million dollar chlorination - detention facility to intercept and treat combined sewer overflows discharging into the Charles River. Construction plans for similar facilities just upstream of a new Charles River Dam are in preparation. Pollution abatement projects to protect the bathing beaches in Boston Harbor were funded in 1972 and are expected to be underway by 1974.

The Secretary of the Interior initiated a conference on 20 May 1968, concerning the pollution of the waters of Boston Harbor and its tributaries. At this session, the Secretary approved the conclusion that pollution, causing substantial economic injury, results from the discharge of untreated or inadequately treated wastes from municipalities, industries, combined sewer overflows, tributary streams, debris and refuse, watercraft wastes and Federal installations.

A second session was held on 30 April 1969, and a third on 27 October 1971, which recommended that further action be undertaken to control the pollution. The conferences also recognized one of the major causes of pollution as combined sewer overflows.

At the second session held on 30 April 1969, evidence was presented relating sludge discharges from the Nut Island and Deer Island wastewater treatment plants to high bacterial counts in Boston Harbor. The M.D.C. in 1969, as a result of an earlier agreement with the Massachusetts Division of Water Pollution Control (MDWPC), installed additional chlorination equipment and instituted year-round chlorination.

On October 21, 1971 an agreement between the M.D.C. and the M.D.W.P.C. addressed the question of sludge disposal as well as expansion of the M.D.C. sewerage system. Subsequently, a sludge disposal study was completed on June 4, 1973 for the M.D.C.

A third session on 27 October 1971 reviewed the sources of pollution identified in earlier sessions. The Regional Administration at this conference recommended that the M.D.W.P.C. address itself to the problem of the need for secondary treatment in order to meet Federal water quality standards in Boston Harbor.

On 2 March 1972, the Committee on Public Works of the U.S. Senate passed a resolution requesting the Secretary of the Army, acting through the Corps of Engineers, to undertake a joint study with the Commonwealth of Massachusetts to recommend wastewater management improvements and alternatives for the Boston Metropolitan area. On 14 June 1972, the Committee on Public Works of the U.S. House of Representatives passed the same resolution (Attachments 1 and 2).

Prior to the House Resolution, the Commonwealth of Massachusetts and the Federal Environmental Protection Agency signed an agreement on 24 May 1972 to undertake comprehensive wastewater management studies in the Boston Metropolitan area. The State-EPA agreement includes in general the following items:

a. Accomplish comprehensive engineering and management studies providing for a minimum of secondary treatment in the Metropolitan Boston region by May 1, 1979.

b. The management study would investigate possible expansion of the MDC region, changes in structure, charges for wastewater treatment, methods of capital financing and consideration of associated wastewater reclamation.

c. Meet requirements of Title 18 CFR, Section 601.25(b).

d. Prepare engineering alternatives for handling of sludges generated from the MDC treatment plants.

The Corps met with the Commonwealth of Massachusetts Metropolitan District Commission in August and September of 1972 to arrange for conducting the two studies as a combined effort which would result in a single jointly prepared report.

On 27 November 1972, an agreement (Attachment 3) was consummated between the Department of the Army, Corps of Engineers and the Commonwealth of Massachusetts. This agreement specified that the two parties would undertake jointly a planning effort for wastewater management in the Boston Metropolitan area. A multi-agency Technical Subcommittee on Boston Harbor chaired by the M.D.C. was established to oversee the comprehensive wastewater management study.

Inasmuch as the MDC was in the process of negotiating with private firms to accomplish those items agreed upon with the Environmental

Protection Agency, the Technical Subcommittee took the position that the Corps' efforts should supplement those items which the MDC would accomplish.

The entire study effort will be accomplished in two phases:

Phase I - Items to be addressed by the MDC through the consulting firm of Metcalf and Eddy, Inc. and its sub-contractor of Peat, Marwick, Mitchell & Co. are as follows:

a. Development of Basic Data for the Study Area. (Information to be included in the report by Metcalf and Eddy but supplied by the Metropolitan Area Planning Council).

b. Establishing Limits and Systems for Eastern Massachusetts Metropolitan Area with Related Economic, Social and Environmental Considerations.

c. Preliminary Engineering Plan for Additional Treatment of Deer and Nut Islands' Flows - Pump Stations and Headworks.

d. Operation and Regulation of Sewage Interceptors and Overflows.

e. Industrial Waste Ordinance

f. Management Study

g. Progress and Final Report of Conclusions

The consulting firm of Havens and Emerson, Ltd. was contracted by the Metropolitan District Commission in October 1972 to accomplish a study of alternative methods of treatment and disposal of sewage sludges from the Deer Island and Nut Island treatment plants.

The Corps' input to the study effort is designed to supplement those items being addressed by the MDC while at the same time satisfy Congressional directives. The major items to be addressed by the Corps during the first phase of the study include:

- a. Public Participation and Information Program
- b. Land Treatment Alternatives
- c. Industrial Waste Survey
- d. Impact Analysis and Evaluation
- e. Stormwater and Urban Runoff
- f. Preparation of Environmental Statement

Those items to be addressed by the Corps in the second phase of the study include:

- a. Determining Existing Condition of Boston Harbor
- b. Determining Potential and Alternative Future Uses of Boston Harbor.
- c. Reuse of Treated Effluent
- d. Reliability of System Performance
- e. Miscellaneous Items with Respect to Cooperative Management of the Study, Coordination, Report Preparation, etc.

B. The Study Area

The Boston Harbor-Eastern Massachusetts Metropolitan Area Wastewater Management Study encompasses 109 cities and towns which are within a 30 mile radius of the City of Boston (Figure 1). More than 3,000,000 people, or better than half of the state population live within these 109 communities. Twenty-four communities lie within the Merrimack River Basin, which is the subject of a separate wastewater management study being undertaken as a cooperative effort by the Corps of Engineers, Commonwealth of Massachusetts and the Central Massachusetts, Montachusett, Merrimack Valley, Northern Middlesex, and Metropolitan Area Regional Planning Agencies.)

Of the 109 cities and towns in the study area, 99 are members of the Metropolitan Area Planning Council. One community lies within the jurisdiction of the Merrimack Valley Planning Commission, four are within the jurisdiction of the Northern Middlesex Area Commission, and 3 are within the Central Massachusetts Regional Planning Commission jurisdiction.

Forty-three of the 109 communities are members of the Metropolitan Sewerage District (MSD) for purposes of commonly collecting and treating their wastewaters. Each municipality within the MSD is responsible for maintenance and operation of its own sewerage system prior to discharging into the MSD trunk sewers. Each community is also subject to the rules and regulations set forth by the Metropolitan District Commission. The MSD system consists of more than 200 miles of trunk sewers, covering an area of approximately 400 square miles and serves approximately 2 million people. Except for wastewater discharged through combined sewer overflows and/or discharged to surface waters, the wastewater from the MSD flows to either the Deer Island or Nut Island treatment plants, where it receives primary treatment and chlorination before it is discharged into Boston Harbor. These systems are now operating at full capacity.

The major waterways that are directly affected by the planning effort in addition to Boston Harbor are as follows:

Charles River

Sudbury, Assabet & Concord Rivers (SUASCO)

Ipswich River

Mystic River

Neponset River

Shawsheen River

South Coastal Streams

C. Organization of the Study

The organizational structure for the Boston Harbor-Eastern Massachusetts Study is presented in Figure 2 and each element is described in the following paragraphs.

State Policy Committee

This committee establishes statewide policy on water quality management planning. It reports to the Governor of the Commonwealth of Massachusetts and is composed of the Secretaries of the Executive Offices of Administration and Finance, Environmental Affairs, Communities and Development, and Transportation and Construction.

This committee will oversee, at the State level, all of the work and determine policy on questions raised during the course of the study. The policy committee will meet, at appropriate times, with the Regional Advisory Policy Committee to discuss regional public policy issues. The State Policy Committee will also meet with the individual Regional Planning Agency Chairman to discuss unique regional policy issues.

Corps of Engineers, North Atlantic Division and New England Division

The Corps of Engineers will advise the State Policy Committee and serves as the general policy body for the conduct of the Boston Harbor-Eastern Massachusetts Metropolitan Area Wastewater Management Study. The division of responsibility will be in accordance with the Agreement between the Department of the Army, Corps of Engineers and the Commonwealth of Massachusetts (Attachment No. 3).

At regular meetings and in conjunction with the other committees, they will develop policy and objectives for the study, as well as to resolve problems which cannot be handled at the lower levels of the organization structure. The Corps of Engineers and the Commonwealth of Massachusetts will ultimately review and adopt the recommended plan for the study area, and transmit the plan to the appropriate governmental agencies.

Regional Policy Committee

This committee will consist of the Chairmen of the Regional Planning Agency boards. They will meet to discuss common regional policy issues and further articulate these issues to the State Policy Committee.

The Regional Planning Agencies represent the citizens in their region and they will address the citizens' opinions as recommendations in the Regional Policy Committee's discussions of policy issues.

State Technical Committee

Under the guidance of the State Policy Committee and utilizing the Office of State Planning and Management in a staff capacity, this interagency technical coordinating committee will direct water quality management planning activities.

All agencies designated on the organizational chart (Figure 2) are permanent members of the committee. Their participation at committee meetings will vary according to their appropriate interest in various planning activities.

Boston Harbor-Eastern Massachusetts Metropolitan Area

Technical Subcommittee

The agencies represented on this subcommittee have permanent representation on the State Technical Committee which advises all state water quality management planning activities. As members of the subcommittee, they will be responsible for the overall direction of the wastewater management planning effort for the Boston Harbor-Eastern Massachusetts Metropolitan area. They will answer major questions concerning planning methodology, and interagency working relationships as they relate to the Boston Harbor-Eastern Massachusetts Wastewater Management Study.

Boston Wastewater Management Study Team

This team will provide the continuing nucleus for coordination and technical efforts on the development of the wastewater management alternatives. The day-to-day determinations and decisions will be made by the study team subject to the review of the Corps of Engineers and the Commonwealth of Massachusetts (Metropolitan District Commission.) Policy questions will first be submitted to the Study Management Team for resolution. Major questions which cannot be resolved by the team will be referred to the Technical Subcommittee and if necessary to the State Technical Committee and finally to the State Policy Committee.

Observer/Advisors

Representatives serving as observer/advisors will assist and advise the Technical Sub Committee on issues raised during the planning process that relate to their current State-Federal Programs.

Citizen Advisory Committee

The Citizens Advisory Committee as referred to in Section IV will encourage citizen participation through the Public Participation Program, and present the citizen's opinion and recommendations to the Study Management Team.

This committee shall consist of representatives from the industrial sector, academic institutions and civic organizations. It is recommended that insofar as possible, the organizations represented be from within the study area.

Public involvement in plan development will be sought through an open planning process. Guidelines for this process are contained in "Open Planning/The Merrimack," September 1971, a report prepared for the Corps of Engineers by the New England Natural Resources Center.

WASTEWATER ENGINEERING AND MANAGEMENT STUDIES
FOR
EASTERN MASSACHUSETTS METROPOLITAN AREA

ORGANIZATION CHART

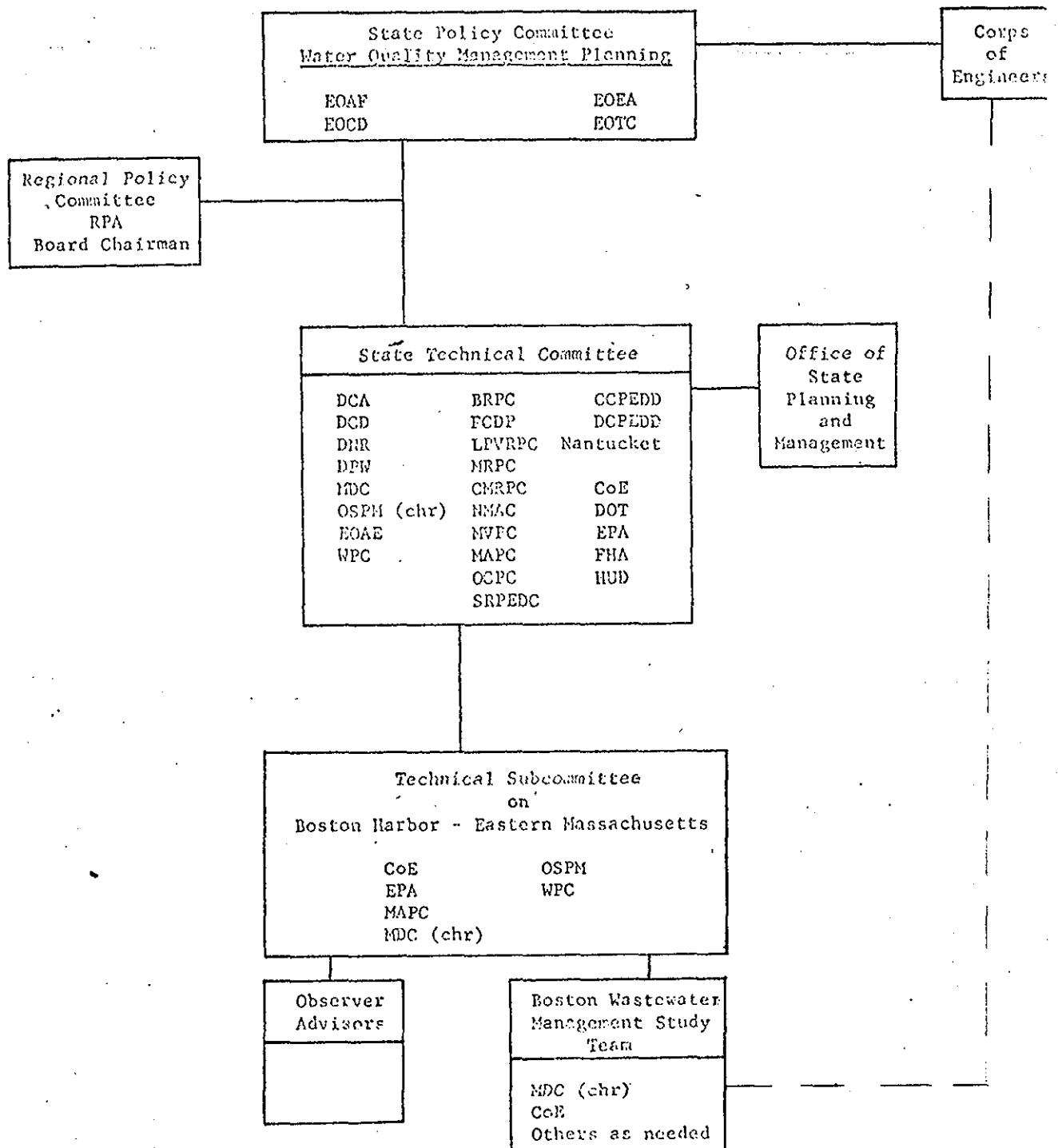


FIGURE 2

Glossary of terms for Organizational Chart of the Wastewater
Engineering and Management Studies for Boston Harbor-Eastern Massa-
chusetts Metropolitan Area.

GLOSSARY OF AGENCIES

BRPC	Berkshire Regional Planning Commission
CCPEDD	Cape Cod Planning and Economic Development District
CMRPC	Central Massachusetts Regional Planning Commission
CoE	Federal, Corps of Engineers
DCA	State, Dept. of Community Affairs
DCD	State, Dept. of Commerce & Development
DCPEDD	Dukes County Planning and Economic Development District
DNR	State, Dept. of Natural Resources
DOT	Federal, Dept. of Transportation
DPW	State, Dept. of Public Works
EOAF	State, Executive Office of Administration & Finance
EOCD	State, Executive Office of Communities & Development
EOEA	State, Executive Office of Environmental Affairs
EOTC	State, Executive Office of Transportation & Construction
EPA	Federal, Environmental Protection Agency
FCDP	Franklin County Department of Planning
FHA	Federal, Farmers Home Administration
HUD	Federal, Housing and Urban Development
LPVRPC	Lower Pioneer Valley Regional Planning Commission
MAPC	Metropolitan Area Planning Council

MDC	Metropolitan District Commission
MRPC	Montachusett Regional Planning Commission
MVPC	Merrimack Valley Planning Commission
Nantucket	Town of Nantucket
NEIWPC	New England Interstate Water Pollution Control Commission
NERBC	New England River Basins Commission
NERCOM	New England Regional Commission
NMAC	Northern Middlesex Area Commission
NRP	Nashua River Program
OCPC	Old Colony Planning Council
OSPM	State, Office of State Planning & Management
SRPEDC	Southeastern Regional Planning and Economic Development Commission
WPC	State, Water Pollution Control

D. Schedule of the Study

A study schedule for the total 18 to 30 month phased effort will be jointly prepared by all participating agencies. Phase one will be completed by September 1974.

The following items will be included in maintenance of the study schedule.

Maintain the established study schedule and include only approved revisions.

Notify proper study authorities as soon as possible of any problems affecting the schedule and their impact thereon.

Prepare and distribute project schedules to all interested agencies, noting critical and/or important features in the phasing of the study.

III. PURPOSE OF THE STUDY

A. Purpose

The purpose of the study is to develop a comprehensive plan for the management of wastewater in the Boston Harbor-Eastern Massachusetts area up to the year 2050.

B. Goals

Goals serve as the basis for plan formulation, design and evaluation of wastewater treatment alternatives. The study goals will be far reaching and long term in nature and be established in the interest of environmental quality, water supply, recreation and fish and wildlife. The implications of the national goal of "zero discharge of pollutants" will be analyzed.*

*Priorities will be established for both goals and objectives based on the severity of a given problem and the needs and desires of the people.

C. Objectives

Objectives are more exact than goals and are set out in measurable quantities with definite long or short term deadlines. The people will have significant opportunity to express their views concerning the objectives through the open planning process. The objectives that will be established comprise planned steps to be taken toward achieving the previously determined goal or goals.*

D. Criteria

Criteria insure the achievement of objectives on a uniform basis. State and Federal legislation, administrative policies and planning guidelines will be reviewed. Sections 18 CFR 601.32 and 18 CFR 601.33 of the Federal Register adopted 2 July 1970, the Water Resources Council Proposed Principles and Standards for Planning Water and Related Land Resources (Part II) and the Federal Water Pollution Control Act Amendment of 1972 (passed 28 September 1972) will receive special review and analysis.

IV. PUBLIC PARTICIPATION

A. Development of the Public Participation Program.

In accordance with Section 101(e) of the Federal Water Pollution Control Act Amendments of 1972, this study effort will be conducted under an "open planning" concept. The purpose is to enable the public to influence the planning process as wastewater management problems are evaluated and alternative solutions to solving these problems are generated. For purposes of this section, "the public" is defined as

*Priorities will be established for both goals and objectives based on the severity of a given problem and the needs and desires of the people.

any governmental official, agency, individual citizen or group of citizens that may be impacted or affected by the proposed plans and alternatives.

The Commonwealth of Massachusetts and the Corps of Engineers, in their signed agreement, state that public involvement in plan development will be sought through an open planning process, the guidelines for which are contained in the report "Open Planning/ the Merrimack," September 1971. It is anticipated that a Citizens' Advisory Panel of 8 - 12 members will be created to assist the study effort. It is the Corps' intention to support this panel and permit the independent functioning of the panel as outlined in the "Open Planning/ The Merrimack" report.

The Metropolitan Area Planning Council under the direction of the Corps of Engineers and the Technical Subcommittee on Boston Harbor will assist in the implementation of the Public Involvement Program. The MAPC with aid from the members of the Technical Subcommittee will be responsible for briefing various local citizen organizations. The MAPC, aided by members of the Technical Subcommittee will periodically conduct workshops and public forums to which local groups and individuals will be invited.

B. Public Meetings

During the course of this wastewater management study, there will be at least three formal public meetings within the study area where the public can officially participate and express their views concerning any alternative. These meetings will be held in the major population centers and in any other areas that may be affected by any wastewater management plan. In conducting these meetings, progress made

in the study effort to that date will be presented in a concise and informative manner. At the conclusion of the presentations, the meeting will be opened to public discussion and the study team will answer any questions that the public might have. It is desired that these meetings be a two-way street; the study team will inform the public, and the public will inform the study team of their needs and desires.

In addition to the regional public meetings, it may be necessary to hold meetings in selected areas to discuss the issues that are directly related to that particular region. The Corps, MDC, and MAPC will conduct and co-sponsor all meetings with the public assisted by the Technical Subcommittee.

C. Brochures and News Letters.

A brochure which explains the study objectives will be prepared by the Technical Subcommittee for public dissemination. Periodically, news letters will be prepared which explain the progress of the study. The news letters would be sent to those public officials and interested citizens whose names come to the attention of the study team.

D. Coordination with the News Media.

The news media will be kept informed of the progress of the study through press releases, conferences, and media briefings. There will be a serious attempt to cultivate the interests of various individuals and groups through the news media so that the public will become involved and informed readers, viewers, and listeners. There will be

no attempt to use the news media to put forth the views of the subcommittee but rather to cultivate public interest through the news media so that all issues involved can be presented in an equitable manner.

V. DEVELOPMENT OF BASIC DATA.

A. Demography, Economic Activity and Land Use

The prospect for future economic growth in any region is dependent on past trends and current conditions. Thus, past changes in the demographic and economic growth of the study areas as compared to United States economic growth and the historical forces that have been influential in shaping the area's present day character will be discussed. The purpose of this section is to set the stage for the analysis of the future economic growth and development of the study area. This task will also provide the necessary economic and demographic information essential for assessing the future demands on water and related land resources.

An inventory of present land use shall be prepared based on the latest available data including aerial photographic interpretations. The land use data generated by the University of Massachusetts, College of Agriculture which delineates the following land-use categories will be used:

Urban Land

Forest Land

Wet Land

Agricultural or Open Land

Outdoor Recreation

A profile of future land use will be prepared based on the latest land use planning and development trends. Strong consideration will be given to town zoning ordinances, state wet lands acts, conservation districts, master transportation plans, etc.

B. Climatology, Hydrology, Geology, and Biota

Basic climatic data will be gathered from published reports of the U.S. Weather Bureau. Data to be compiled for stations representative of the region will include the following: mean monthly and annual temperature and precipitation, extremes of temperature and precipitation, amounts and duration of snowfall.

The data described above, together with soil moisture data obtained from the Soil Conservation Service will be extrapolated to furnish evaporation and transpiration rates. These data will in turn serve as the basis for our computing the "water balance" (after Thornthwaite) for various sub-areas in the basin. This information will be valuable in calculating amounts and duration of land application of effluent.

Hydrologic data for surface streams will be inventoried. The Boston-Eastern Massachusetts area will be subdivided into the drainage areas of the South Coastal Streams and the Sudbury, Assabet, Concord, Mystic, Charles, Ipswich, Shawsheen and Neponset Rivers. Quantitative discharge data to be reported for each of the above-mentioned streams include average,

yearly and monthly discharge, mean annual flood, flood frequency and low flow analyses. This data will be collected from USGS gaging stations. If required, discharge data can be reliably estimated for ungaged streams from analysis of regional area versus discharge relationships. Flow duration curves for the major streams will be prepared.

A general description of the regional groundwater will be compiled from existing reports. A detailed study of groundwater occurrence will be performed at all areas chosen for study for land application of effluent.

A geologic map of the bedrock at specific sites chosen for use (land application, treatment plants, and collection and transmission pipelines) will be compiled from existing data. The type of bedrock and its chemical/mineralogical characteristics will be studied. The rocks' porosity and permeability will be estimated. Information regarding the possibility of earthquakes and any potential damage will be gathered from the USGS and other agencies such as the Weston Seismological Center.

At the specific sites selected for use, the surficial geology will be examined in more detail. Edaphic information for the study area will describe soil textures, cation exchange capacities, soil depths, infiltration and percolation rates, organic matter content, extent and location of specific soil types, depths to ground water and the occurrence of impermeable layers within the soil profile.

The topography and type and distribution of soils at the selected sites will be gathered from maps and observations made by the USGS and the SCS. Modifications to the physical characteristics of the land, both natural and manmade, will be examined.

Data and information defining the existing aquatic environments of Boston Harbor and its tributaries in terms of species composition, community stability, nutrient cycles and budgets and energy flow will be examined. Ions, molecules, compounds and/or organisms added to these communities from natural and man-made sources will be determined. Current uses of the aquatic biota for recreational, economic, aesthetic and social purposes will be ascertained.

Agricultural and "natural" systems will be examined for important micro- and macro-botanical and zoological species, transpiration rates, nutrient cycles and budgets, moisture requirements, growth season, crop productivity, and community stability. Existing information describing the tolerances and responses of organisms to increased moisture, or specific wastewater constituents, will be inventoried. Additional data pertaining to specific lands and amounts of fertilizers, herbicides and pesticides used in the study area will be gathered. The geographical areas and times of year in which these chemicals are used will be determined.

C. Industrial Waste Survey

An inventory will be made to determine the type, number and size of the various industries in the Boston Metropolitan area. It is

anticipated that a questionnaire asking the following questions will be sent to each industrial plant.

- The types of product manufactured/processed
- Amount of product produced each year
- Amount of water consumption and water source
- Amount of waste flow
- Approximate waste constituents
- Point of discharge

An estimate of the amount and type of waste constituents will be determined by sampling representative industries. Those parameters to be measured are: metals, toxics, organics, nutrients, color, odor, suspended solids, and oil.

D. Water Use and Consumption, Waste Loads, Sewer System, Infiltration, and Existing Treatment Facilities

Consumptive and non-consumptive uses will be studied utilizing existing data and field surveys. Municipal and industrial water supplies, agricultural, recreational and storage uses, and water requirements for streamflow maintenance for fish and wildlife will be included. Community water sources will be verified, and per capita consumption figures will be determined for minor civil division, regional and basin.

In order to formulate realistic and viable treatment alternatives, a water use and water demand profile will be projected through the designated time intervals. Per capita water consumption figures will be based upon municipal, industrial and agricultural water consumption projections. Non-consumptive uses and demands of water, i.e. boating, swimming, etc. will also be projected.

Municipal, industrial, agricultural, stormwater, urban runoff, and combined sewer overflows, waste load volumes and related quality characteristics will be determined. Waste load volumes and related quality characteristics for municipal, industrial and agricultural flows will be projected and serve as the basis for treatment plant design.

Existing collection, and transmission systems will be inventoried. The adequacy of the existing system will be reviewed in light of meeting the overall study goal. Specific technical problems in system performance, i.e. infiltration, will be given particular attention.

Representative locations in various communities within the study area will be selected and metered for a two-week period in the spring and fall. The selected communities will be metered for purposes of projecting infiltration rates within the entire study area.

All existing and scheduled or proposed treatment facilities will be inventoried to include existing pump stations and headworks. The adequacy and reliability of these facilities will be analyzed in light of annual reports and operational records and project dry and wet weather flows and pollution loads.

E. Water Quality

The chemical, physical and biological water quality characteristics of Boston Harbor and its major tributaries will be determined. Groundwater locations (local and regional) will also be analyzed for quantity and quality. Water quality programs and projects will be inventoried. This inventory will include existing wastewater treatment facilities, facilities proposed or under construction under the current

implementation schedule of the Division of Water Pollution Control, low flow augmentation projects, and instream treatment projects such as aeration, destratification, and oil pollution control barriers.

Population, land use and economic and industrial projections will necessarily be presented prior to projecting the water quality of Boston Harbor, its tributaries and other water bodies within the study area. The existing State-Federal implementation program will serve as the water quality projection baseline.

VI DEVELOPMENT OF ENGINEERING ALTERNATIVES

A. Develop Range of Treatment Alternatives

A range of treatment alternatives, each of which provides for the treatment of point and non-point sources of municipal, industrial and stormwater wastes generated in the Eastern Massachusetts Metropolitan Area, will be developed. Various types of alternatives to be developed include; all harbor facilities, satellite facilities, land application and combinations of the preceeding.

1. All Harbor Facilities - An evaluation of the possible use of ocean outfalls in lieu of addition of secondary treatment facilities at the existing Deer Island and Nut Island Sewage Treatment Plants will be conducted to determine the order-of-magnitude costs and water quality conditions. The evaluation will be based on a review of existing data, reports, and other information related to the present discharge of primary effluent wastewater in Boston Harbor and environs and possible future discharge via an ocean outfall alternative. The generalized location for the possible ocean outfall(s) will be established by the evaluation.

The existing treatment facilities will be examined for upgrading to secondary treatment with and without satellite treatment plants. Preliminary engineering designs for secondary treatment will be carried out for the Deer Island and Nut Island flows. Layouts for each selected process alternative will be presented including sizing for major components. Consideration will be given to the adequacy of the existing facilities and sites to accommodate treatment of the entire

projected design flow. Consideration will be given and preliminary costs developed for advanced treatment at both Nut Island and Deer Island. For those alternatives judged most advantageous, hydraulic profiles for plan improvements and architectural renderings of plants will be prepared.

2. Satellite Facilities - Various combinations of satellite treatment facilities will be examined. All plans for satellite facilities will be based on advanced waste treatment processes and will be evaluated on the basis of confidence factors considering the history of satisfactory process operating experience. The most reliable systems will be presented on the basis of space requirements, hydraulic and process compatibility with existing systems, the degree and reliability of sludge handling and air pollution abatement systems, and relative capital and operating costs.

3. Land Application - The land application alternatives will be developed utilizing three different methodologies; spray irrigation, overland flow and rapid infiltration. Available land throughout the Commonwealth of Massachusetts will be examined for potential use as land application sites. At least one alternative will be developed which will provide land treatment for all wastewaters generated in the Eastern Massachusetts Metropolitan Area.

4. Combinations - A series of alternatives will be developed which will utilize combinations of harbor facilities, satellite plants and land application techniques. The same considerations described in the preceding paragraphs will be undertaken in examining the combination alternatives.

B. Sludge Treatment, Reuse, and Disposal

Sludge treatment alternatives for ocean outfall and satellite plants will be developed as part of each wastewater treatment alternative. The sludges generated from the treatment systems will be examined for potential uses, such as reclamation of metals and minerals and use as a source of energy.

C. Reuse of Effluent

Possibilities for reuse, reclamation and recycling of wastewater will be examined and proposed as an integral part of each alternative. Possible reuses include:

- Cooling water
- Groundwater Recharge
- Industrial Process Water
- Irrigation
- Municipal Water Supply
- Prevention of Salt Water Intrusion
- Recreation
- River Flow Augmentation

D. Operation and Maintenance Requirements

The staffing requirements necessary to administer, operate and maintain the regional wastewater management plans will be prepared. An organizational chart complete with description of positions, chain of command and number of positions required will be shown.

A listing of existing plants in the study area with assigned personnel will be compiled to determine the availability of personnel for the new systems.

A recommended program for training personnel, especially in the field of advanced wastewater treatment, will be prepared. A synopsis of ongoing EPA and NE Interstate Water Pollution Control Commission training programs will be made.

Estimated costs will be prepared to reflect office equipment, trucks, laboratory gear, etc., required for maintenance and operation activities.

E. Cost Estimate

Construction, operation and maintenance costs of the collection, transmission and treatment systems will be determined. These costs would include land acquisition costs, staffing requirements for supervision and administration, operational personnel, energy requirements, estimated repairs and upkeep, chemicals, etc. Equipment and laboratory gear required for maintenance and operation will also have cost estimates.

With regard to industrial treatment, costs involved with inhouse waste segregation and water reuse should be balanced by money saved through product recovery and decreased water bills. Comparative cost analysis must be made for on-site pretreatment versus user fees to municipal wastewater treatment plants.

VII. COMBINED SEWER OVERFLOWS

A. Basic Model Application

In order that the range of alternative solutions to urban water quality and quantity transport may be systematically evaluated, computer modeling and simulation techniques will be employed. Existing interceptors and treatment facilities in the study area will be modeled to include dry weather flows where systems are separated and both stormwater and dry weather flows where systems are combined. Modeling of the interceptor system will include pipelines of any slope, junction structures, pumping stations and overflow facilities. In order that the rainfall-runoff process may be properly represented in combined sewer areas, major combined sewers and their tributary areas will also be modeled. In addition to providing an investigative analytical tool, the computer model provides a means for fast and inexpensive updating of plans in the future.

B. Design Criteria Selection

Basic hydrologic data will be compiled and evaluated for purposes of selecting a design storm. Storms of various intensities, durations, frequencies and spatial distribution will be selected for simulation. Available soils data will be studied to select parameters for infiltration in various locations of the study area. Population and land use data and projections will be evaluated and water consumption, sewage flow and industrial wastes flow and quality records will be studied to develop the dry weather flow contributions to the sewerage systems.

C. Model Consolidation and Demonstration

For purposes of systematic analysis, a network or series of models for the overall study area will be developed. The existing interceptor

system will be the basic network with the sub-basins modeled as the extreme branches. Advantage will be taken to generalize in those areas where possible. The selected design criteria and related parameters would be verified by demonstration runs against measured values and data at specific sites within the study area.

D. Evaluation of Alternatives

The model will be used to allocate and monitor the flows and waste parameters for the alternative treatment of dry weather flows. Incorporated in this effort will also be the evaluation of alternative plans for regulation of combined sewer overflows. The effects of future population growth and increased imperviousness will be included. Each plan will be analyzed by subjective examination of modeling overflows. The more favorable plans will be ranked in terms of constituent removal, feasibility, cost, short and long term benefits and receiving water quality criteria.

E. Personnel Training and Model Installation

Selected personnel from the various state agencies will be trained in the use of the model. A manual for the use of the model by other personnel will be prepared along with the installation of the model.

F. Unified Control of Pollution Discharges to the Boston Harbor Drainage Area

Consideration will be given to the need for the overall management and operation of facilities that have or will be constructed for the purpose of total resource management and control of pollution discharges to water bodies tributary to the Boston Harbor drainage area.

VIII. STORMWATER AND URBAN RUNOFF

A. Storm Drainage Network

Communities that have separate systems for collection and transmission of stormwater and urban runoff flows will be marked on maps of suitable scale. The major existing storm drainage networks within these communities will also be delineated. Existing hydraulic capacities as well as present methods of control and treatment of stormwater and urban runoff flows will be inventoried and evaluated.

B. Rainfall and Runoff Characteristics

The quantity and quality of urban runoff and rainfall will be determined. At selected sites within the study area, analysis will be made for specified nutrients and other conditions as appropriate in addition to BOD, SS and coliform bacteria.

C. Stormwater Flows

Stormwater flows and runoff projections will be made for various storms using projected land use information. Runoff coefficients will be determined and serve as the basis for projected volumes of flow and design of treatment facilities.

D. Effects on Receiving Streams

Existing impacts of stormwater flows on receiving streams will be analyzed as well as the effect on water quality caused by the detention and treatment of stormwater runoff.

E. Treatment and Control

Various methods for stormwater control and treatment will be examined. The practicality, applicability, costs, and benefits of each method will be assessed.

IX. DEVELOPMENT OF INSTITUTIONAL AND FINANCIAL ALTERNATIVES

A. Industrial Waste Ordinance

An industrial waste ordinance will be formulated for those industries within the study area that are presently discharging or propose to discharge into the MDC sewer system. Representative samples will be obtained and analyzed during the inventory phases of the study and serve as the basis for establishing an industrial waste charge.

B. Comparable Operations

Profiles of comparable sewage treatment operations in other areas of the U.S. or Canada will be prepared. The profiles would include type of legal structure, territorial authority, method of revenue financing, method of debt financing, legal powers, degree of and method of community control, internal organizational structure and policies.

C. Goal, Objectives and Purpose of Organization

The goal, objectives and purpose of the organizational structure will be defined. Existing and proposed state legislation, agencies and operating policies will be reviewed. The current and proposed role of significant Federal, regional, state, and local agencies, which impact on sewerage treatment and water pollution control in Massachusetts and Boston Harbor will also be reviewed and be compared to those profiles of similar operations in other parts of the country. Possible goals, objectives and purposes of the organizational structure will be proposed.

D. Criteria for Organizational Design

The criteria to be used in evaluating alternative organizational design and structure for managing the sewer systems in the study area will be established. The following factors will be taken into consideration

in the development of the criteria: adherence to water quality standards, planning requirements, planning interactions with other regional and state agencies, responsiveness to voters, degree of local control, goals and objectives, degree of authority, legislative changes required, responsiveness to future change and the ability to evaluate performance.

E. Capital and Operating Financial Requirements

The estimated capital and operating financial requirements will be determined. Rough estimates will be made of gross capital requirements, net capital requirements, existing investment in facilities, outstanding debt, debt service requirements and present and future operating costs.

F. Effect of Rate Structures

The effect of alternative rate structures on different users will be computed and a recommended structure will be proposed. The general nature of cost elements will be identified and defined to include consideration of administration, operation and maintenance, new construction, etc. Cost allocation and billing concepts will be developed providing numerous considerations of adequacy, efficiency, etc.

G. Impact of Financing Arrangements on Future Organization and Administration

Estimated revenues to be generated in future periods will be developed. Alternative methods to provide capital to finance the construction or expansion of proposed or existing facilities will be examined. Criteria for selecting the preferred financial method will also be developed.

H. Alternative Organizational Design

Present and future alternative organizational designs will be developed and the relative advantages and disadvantages of each will be

evaluated based on the established criteria. Reorganization of existing authorities and the creation of new and broader authorities will be examined.

I. Recommended Organizational Structure

Recommendations will be presented for short and long-term organizational structure and institutions for operating and managing the sewer systems. The legal constraints and legislative requirements necessary to implement the recommended organizational structure will be identified and examined. Guidelines will be developed to serve as a basis for drafting the needed legislation.

J. Recommended Financing and Rates

Preliminary recommendations on alternative financing and rate structures will be prepared based on the investigations and conclusions in previous work items.

X. IMPACT ANALYSIS AND EVALUATION

A. Social

Each regional wastewater management plan will cause physical changes, and in turn, alter associated human activities to varying degrees. The formal methodology for assessing the resultant social impacts has not been established because of the inability to quantitatively assess human experiences, needs, and values. However, an attempt will be made to evaluate social impacts from wastewater management plans.

Each plan will be evaluated for its influence on existing land use patterns, public utilities and services, and community and individual tax structures, on both a long and short term basis.

B. Hygienic

Hygienic impacts will stem primarily from the utilization of renovated water and processed sludges in agriculture and for recreation and water supplies. Toxic, infectious, or irritating agents to human health will be addressed.

C. Aesthetic (Visual-Cultural)

The wastewater treatment and disposal components, facilities, transmission lines, etc., of each alternative will have different impacts upon the visual-cultural environment according to value judgments by each individual. However, accepted methods based on statistically recorded preferences will be used to evaluate visual-cultural impacts. Primary impacts will result from the direct changes in land or water surface.

D. Ecologic (Terrestrial & Aquatic)

Each wastewater treatment alternative proposed will impact upon the biotic and abiotic components of terrestrial and aquatic ecosystems.

Through reduction in pollutant levels, each alternative will result in changes which may create new and presumably more diverse aquatic communities. It is important that each wastewater management alternative enhance the vitality and integrity of the system into which pollutants were previously discharged. Ecological impacts will principally be assessed as wastewater treatment strategies, affect the existing climate, geology, hydrology, water quality and biotic communities of the study area.

E. Economic

The criterion essential to the assessment of economic impacts are based upon whether the direct or indirect ecologic, hygienic, aesthetic, or social impacts imply net income changes to the nation, to the region, or to affected human activities or landowners. This criterion will be applied to each of the major forementioned impact areas to enable the specification of the geographical area having the greatest probable net income changes. In each geographical area, assessment will be in terms of the use and the user of the resource. For each resource use, the nature of the net income change will be assessed in terms of cost of using a resource, cost of using a substitute or alternate resource, and cost of revenue foregone.

F. Institutions

The institutional arrangements developed for the alternative wastewater management plans will be subjected to an impact analysis and evaluation process. The implications of creating or reorganizing existing administrative and governmental structures will be examined. If new legislative authority is proposed, i.e. changes in land use policies and land use control, all issues associated with the recommended legislative

changes shall be enumerated and discussed. Section IX, Development of Institutional & Financial Alternatives, should be referred to for a more detailed discussion.

The full impact of the various proposed cost sharing alternatives will also be examined. All advantages and disadvantages will be discussed and presented in sufficient detail for proper evaluation.

G. Evaluation

The evaluation process will provide the basis for modifying and detailing alternative treatment strategies. The study team will evaluate each wastewater management alternative for its performance and contribution towards achieving the study goals and the objectives set forth by the Water Resources Council in its "Principles and Standards," dated 21 December 1971. The Water Resources Council's objectives are to enhance:

1. National Economic Development - the impacts upon the nation's goods and services in terms of water supply, recreation, fish and wildlife, power, irrigation, etc.

2. Regional Development - the impacts upon regional employment, population distribution, economic base, individual income, improved community services and utilities.

3. Environmental Quality - the effect on the physical-biological system which sustains all life. Urban and rural areas of natural beauty and human enjoyment, such as open space, forest lands, lakes, rivers, streams, estuaries, marshlands, etc., must be given careful consideration during the planning process.

4. Social Well-Being - the impacts upon the security of life and health as affected by disease and the overall quality of life.

Each alternative must be evaluated to assure that it achieves the stated objectives of the study while minimizing adverse environmental, aesthetic, hygienic, social and economic impacts. In addition, the requirements of the Environmental Protection Agency state that the alternative be cost effective. The alternative must be a system which achieves the objectives at a greater differential between benefits and costs than other systems, i.e. the cost may be equal for both systems but one system may have greater benefits than the other one.

XI. RECOMMENDED PLAN

A. Plan for the Area

The culmination of all the preceding efforts will be the selection and recommendation of a plan for wastewater management in the Eastern Massachusetts Metropolitan Area by the Technical Subcommittee. One of the alternatives developed will be selected by the agencies involved as the recommended plan for the study area based on numerous evaluation criteria.

B. Additional Treatment for Deer & Nut Island Flows

An immediate action plan to include costs and benefits will be presented that will provide a minimum of secondary treatment at the Deer and Nut Islands treatment plants. This plan will be an integral part of the overall plan for the Eastern Massachusetts Metropolitan Area. The necessary facilities will be presented in sufficient detail to allow for proceeding to final design as soon as plan approval is given.

C. Treatment & Disposal of Deer & Nut Island Sludges

A plan will be presented that will provide for the treatment and disposal and/or reuse of the sludges generated from the Deer & Nut Islands treatment plants. The necessary facilities will be presented in sufficient detail to allow final design and construction upon approval and funding. The plan will provide for the discontinuation of the discharge of sludge to the waters of Boston Harbor by May 1, 1976.

D. Implementation Plan

A strategy will be presented which will provide for the implementation of the recommended plan. Recommendations for necessary legislation, funding, and construction schedules will be made. The plan will outline implementation and progressive construction requirements

to meet the wastewater management needs of the Eastern Massachusetts
Metropolitan Area to the year 2050.

XII. ENVIRONMENTAL IMPACT STATEMENT

Section 102(c) of the National Environmental Policy Act of 1969 requires the preparation of an Environmental Impact Statement and its filing with the President's Council on Environmental Quality.

The environmental statement will be an independent report summarizing the direct and indirect environmental impacts of the selected wastewater management plan and be developed utilizing the material generated in Sections V and X. The statement will be prepared according to established Federal guidelines and Chapter 781 of the Commonwealth of Massachusetts Acts of 1972, titled: "Environmental Policy Act," so that all environmental impacts will be sufficiently presented to permit the independent appraisal and evaluation of the favorable and adverse effects of the selected plan. Significant relationships between the selected wastewater management alternative and other existing or anticipated developments will be described.

The environmental impact statement will be prepared in a simple and concise manner with the understanding that it will be a public document and may receive considerable attention from the news media and careful public review.

Throughout the course of the study, the general public will be kept fully informed concerning all environmental impacts and will be provided the opportunity to express their views through the public participation program.

The environmental assessment will begin during the early stages of the study and continue until the conclusion of the study.

XIII. STUDY MANAGEMENT AND REPORT

A. Report

The basic function of a plan report is to transmit the study results to technically and non-technically oriented readers, who are not intimately familiar with the subject. This section establishes the format of the plan report and ancillary documents for the Eastern Massachusetts Metropolitan Area Wastewater Management Study.

Reporting requirements and procedures will correspond to guidelines with Federal and State Engineer Manuals, Engineer Regulations and Engineer Circulars applicable to Survey Scope Studies.

The report will consist of a summary document, main report and supporting appendices. Appendices will be written separately, providing for continual drafting and review as the study progresses. The only exception to this statement is the Comments Appendix which is designed to contain information received after the draft Survey Report is distributed. Conversely, the Background Information Appendix Draft can be completed early since it provides the necessary base information from which all plan formulation proceeds.

The report arrangement includes:

1. Summary Report - A well-illustrated summary for non-technical readers explaining how the study was conducted, the findings, and the final recommendations. (To be approximately 50 pages at most).
2. Main Report - A main report which will be more in depth than the Summary Report and which shall address each phase of the study (i.e: background information, plan formulation, etc.).

3. Appendices - Separate appendices for each of the following principle portions of the study.

Background Information

Plan Formulation

Design and Cost

Environmental Impact Assessment

Evaluation

Institutional Arrangements

Public Participation Program

Comments on Draft Report

Note: Plan Formulation, Design and Cost, Environmental Impact Assessment, Evaluation, Institutional Arrangements and Public Participation Program shall contain the detailed information necessary to support the plan formulation process.

The appendices will have as much detail as possible. As a minimum, technical objectives will be met, location and siting will be proposed, both resource requirements and reliability data will be displayed, and costs will be detailed enough so that selected components can be recommended for authorization.

Further, the Main Report and Appendices will include display of the following:

- . Base condition, which includes an analyses of existing treatment systems design capacity, reliability and overall system performance.

- . Collection facilities required for each proposed alternative, which includes costs and location of the pipe, cost and location of pumping stations, and capacity added, and the reliability of the system.

. Additions to the current treatment facilities, which include the cost of each additional unit process and the quality of the treated wastewater after each process. Resource requirements of each process, the additional capacity, and the total system reliability will be included.

. New treatment facilities, which include the cost of each new facility broken down on a per unit process basis. The quality and quantity of treated wastewater and other by-products, resources required, facility reliability, and siting considerations will be included.

. Additional transmission facilities which include costs, location of transmission routes, cost of pumping, and loading facilities, reliability of the system against toxic spills, and volume handled.

. Reuse facilities which include quality, quantity, and uniformity of by-products to be reused, processes necessary to reach the quality required and their associated costs, location of the reuse facilities, net economic returns, reliability of the reuse facility, and estimated longevity of demand.

. Multiple-use opportunities which include joint siting of facilities and pipelines with other existing or proposed transportation networks such as highways or power transmission rights-of-way.

The Wastewater Management Plan will include that portion of Boston Harbor-Eastern Massachusetts Metropolitan Area and will consist of the towns as shown in Figure 1, the Study Area Map. The geographical area of the Boston Harbor-Eastern Massachusetts study area contains all the Metropolitan Sewer District and is almost identical to the cities and towns under the jurisdiction of the Metropolitan Area Planning Council. The plan for the study area will be presented to the Metropolitan Area Planning Council for their consideration as their regional wastewater management plan.

The regional wastewater plans for the other Regional Planning Agencies will be included in the Merrimack River Basin Wastewater Management Study being prepared separately. Portions of the Boston Harbor study area are also within the Merrimack River Basin Wastewater Management Study area. In these overlapping regions of study, goals and objectives must be closely coordinated to ensure that compatible wastewater management plans are formulated.

Upon completion of the first phase of this study effort, segments of the Boston Harbor-Eastern Massachusetts regional plan will be selected for more in depth study. The selected projects will be part of the overall regional plan, be self-sustaining, and be the proposed initial increment of construction for implementing the regional plan. The selected projects will be developed and recommended for authorization of further design and ultimate construction.

4. Ancillary Documents - Ancillary documents will accompany the completed report when the report is officially transmitted for approvals. These documents essentially fall into two categories depending upon their purpose and use. The categories are:

a. Documents prepared in the course of the study for use at public meetings, and transcripts of those meetings. All other pertinent documents regarding coordination and public involvement should be contained in the appendix entitled "Public Participation Program."

b. Any document that requires coordination and review prior to study completion.

B. Draft Report Review

Engineer Regulation 1120-2-112, dated 1 July 1971, entitled "Coordination of Investigation and Reports with Clearinghouses" will be followed to insure that the potential impacts of the alternatives are recognized by all Federal and non-Federal agencies. A mailing list for the draft report will be furnished to OCE at least 30 days prior to expected distribution date.

Review procedures for the Commonwealth of Massachusetts shall also be adhered to in processing the reports for approval.

The plan shall be prepared and forwarded for the review and approval of:

The State Water Quality Technical Committee

The State Water Quality Policy Committee

The signatories of the report shall include:

The Executive Office of Environmental Affairs

The Metropolitan District Commission

The Metropolitan Area Planning Council

The Environmental Protection Agency

The Corps of Engineers

C. Updating the Report

Prior to the completion of the Boston Harbor-Eastern Massachusetts Wastewater Management Study provisions and recommendations shall be made for future modification, evaluation and updating of the report after it has been completed.

D. Maintain Overall Study Program Management

The principal study effort shall be accomplished by the Boston Wastewater Management Study Team consisting of personnel from the following agencies:

Full-Time Basis

Corps of Engineers

Commonwealth of Massachusetts:

Metropolitan District Commission

Part-Time Basis (on call)

Environmental Protection Agency

Commonwealth of Massachusetts:

Division of Water Pollution Control

Dept. of Commerce & Development

Dept. of Community Affairs

Dept. of Natural Resources

Office of State Planning & Management

Dept. of Public Works

Central Massachusetts Regional Planning Commission

Metropolitan Area Planning Council

Northern Middlesex Area Commission

Merrimack Valley Planning Commission

Private Consultants

Private consultants shall be utilized for major study inputs. The following items must be addressed in the management of the study program:

Develop and maintain a system for overall schedule, cost, performance evaluation, and control of the program.

Formulate and maintain a task schedule and cost plan for all agency activities in the study.

Supervise and evaluate the input from all agencies and staff sections.

Negotiate, administer and supervise all contracts with private consulting firms contributing to the study.

Manage and direct the study team efforts in data collection, determining system alternatives, assessment and evaluation of environmental impacts, institutional arrangements and public information and participation program.

Coordinate training of new study staff members.

E. Maintain Study Schedule

The following items will be included in maintenance of the study schedule:

Maintain the established study schedule as noted in Annex 4 and include only approved revisions.

Notify proper study authorities as soon as possible of any problems affecting the schedule and their impact thereon.

Prepare and distribute project schedules to all interested agencies, noting critical and/or important features in the planning of the study.

F. Manage Cost of Program

The following will be addressed in managing the cost system:

Maintain records of the study costs so that they are easily definable in such areas as labor, overhead, equipment, supplies, reproduction, etc.

Continuously review program costs to assure early notification of overruns, and the need for reassignment of funds for tasks as the study progresses.

Review costs and status of work with respect to private consultants and other agencies which provide study input under contracts, purchase orders, etc.

G. Maintain Working Relationships between Agencies

The study team shall establish working relationships between all agencies, consultants, and others who have a direct contribution to the study.

Regular monitoring conferences shall be held. All participating agencies, consultants and others will be invited for the purposes of briefing, requesting action or presenting study status. Whenever required, monitoring conferences may be called on short notice and at times other than the regular scheduled meetings.

Working relationship shall be maintained with personnel conducting studies in the Merrimack River Basin.

Coordination will also be maintained with such agencies designated as observers on the organizational chart.

XIV. ADDITIONAL STUDIES

The following activities are phase two of the study and scheduled for completion after phase one.

A. Monitoring of System Performance

The reliability of the wastewater treatment systems will be continually assessed by examining their effectiveness and dependability. It is absolutely essential that the various treatment systems be carefully managed, especially advance wastewater and land application of secondary effluent and sludges. Various methods of monitoring and assessing the functioning of the total treatment system will be explored.

B. Condition of Boston Harbor

Extensive sludge deposits have been reported in some areas of Boston Harbor and its tributaries as a consequence of discharging untreated or partially treated wastewater and sludges over many years. It is paramount that information pertaining to the extent, composition, decomposition, and constituents released from these sediments and the heterotrophic organisms inhabiting them be obtained. Where data is nonexistent, it must be generated so that impact of the sludge deposits on aquatic organisms can be assessed. Biota inventories will also be undertaken if determined necessary.

Other questions concerning the present and future environmental conditions of Boston Harbor and the opportunities and limitations that these conditions present will be examined. Additional information will be required for the full understanding of a given issue or problem. Specific technical and scientific research needs will be identified.

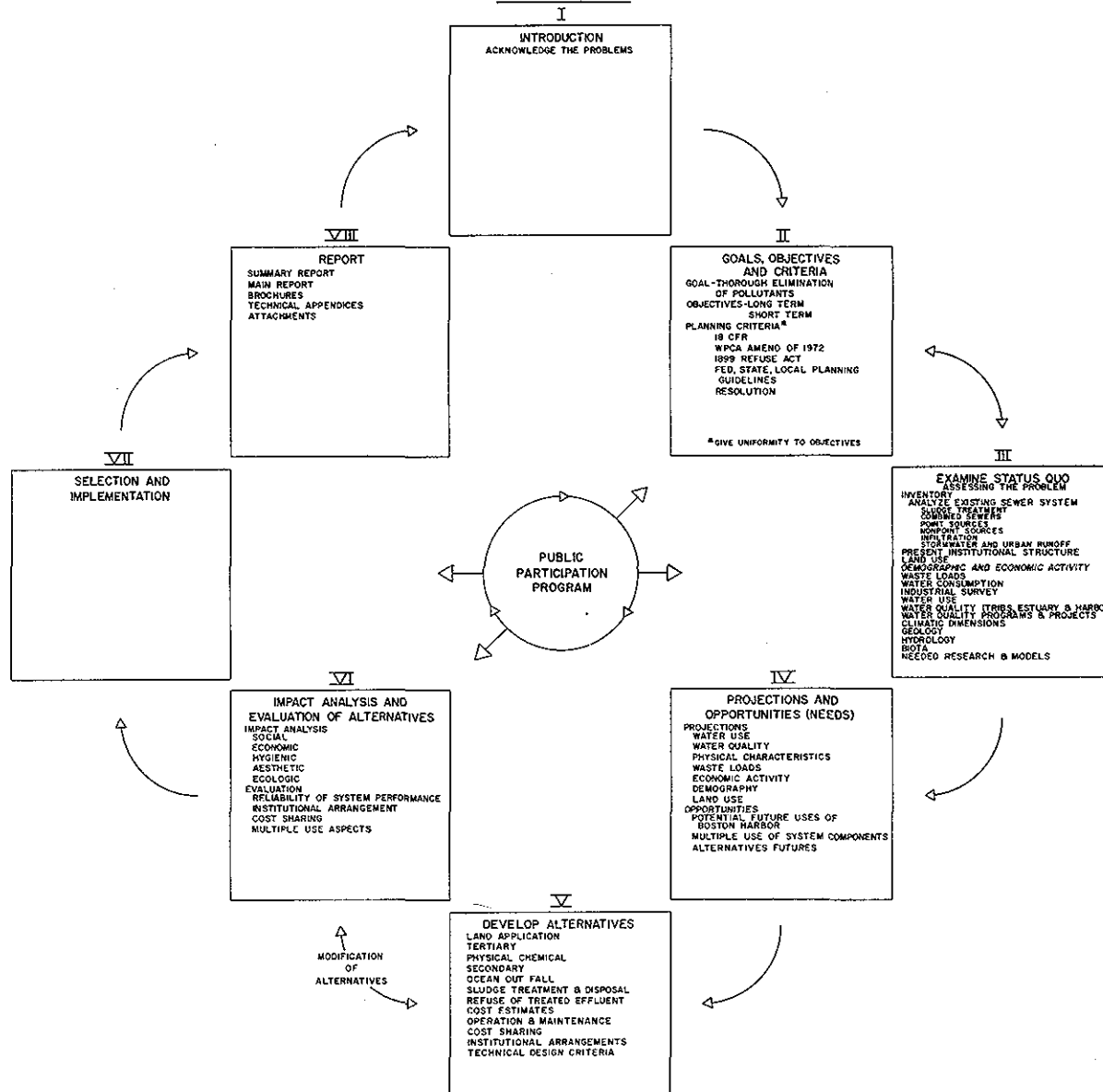
C. Future Uses of Boston Harbor

Boston Harbor will have many future demands placed upon it such as recreation, commercial fishing, etc. These demands will be discussed in light of growing recreational needs and demands. Various options for present and future use will be discussed to include resource management in terms of conservation practices and measures of preservation. Other items which may impact the harbor shall be investigated such as offshore mining for sand and gravel and offshore terminal facilities for petroleum tankers and oil drilling.

D. Modeling of Boston Harbor

The types of models already available e.g. mathematical, physical, chemical and biological, will be examined for effectiveness, utility, reliability, scope and cost. The need to expand the existing data base concerning the water quality and aquatic environment of Boston Harbor will be reviewed. The development of various mathematical and physical models which would permit a greater knowledge and understanding of the water bodies in and around Boston will be examined.

**BOSTON WASTEWATER STUDY
FLOW DIAGRAM
PLANNING PHASES**



THE ENVIRONMENTAL IMPACT STATEMENT
WILL BE A CONTINUAL EFFORT THROUGH
THE COURSE OF THE STUDY

**BOSTON-EASTERN MASSACHUSETTS METROPOLITAN AREA
WASTEWATER MANAGEMENT STUDY
SUMMARY OF STUDY TASKS**

PLANNING PHASES

GOALS I
OBJECTIVES & CRITERIA II

INTRODUCTION
GOALS & OBJECTIVES
PLANNING CRITERIA &
PUBLIC PARTICIPATION

BY
MDC & C OF E

	PRINCIPLE MDC TASKS	JOINT MDC-CORPS TASKS	PRINCIPLE C OF E TASKS
EXAMINE STATUS QUO III	1. INVENTORY AND ANALYZE EXISTING SEWER SYSTEM: SLUDGE TREATMENT COMBINED SEWERS POINT SOURCES NONPOINT SOURCES INFILTRATION 2. PRESENT INSTITUTIONAL STRUCTURE 3. DEMOGRAPHIC AND ECONOMIC ACTIVITY 4. WASTE LOADS 5. WATER CONSUMPTION	1. LAND USE 2. WATER USE 3. WATER QUALITY 4. WATER QUALITY PROGRAMS & PROJECTS 5. CLIMATIC DIMENSIONS 6. GEOLOGY 7. HYDROLOGY 8. NEEDED RESEARCH & MODELS	1. STORMWATER & URBAN RUNOFF 2. INDUSTRIAL SURVEY 3. BIOTA 4. PHYSICAL CHARACTERISTICS
PROJECTIONS & OPPORTUNITIES IV	6. PROJECT: WASTE LOADS ECONOMIC ACTIVITY, DEMOGRAPHY	9. PROJECT: WATER USE, WATER QUALITY, LAND USE	5. PROJECT PHYSICAL CHARACTERISTICS 6. POTENTIAL FUTURE USES OF BOSTON HARBOR 7. MULTIPLE USE OF SYSTEM COMPONENTS
DEVELOPMENT OF ALTERNATIVES V	7. DEVELOP PHYSICAL-CHEMICAL, TERTIARY OCEAN OUTFALL AND OTHER TREATMENT ALTERNATIVES 8. SLUDGE TREATMENT AND DISPOSAL 9. COST ESTIMATES 10. OPERATION AND MAINTENANCE 11. COST SHARING 12. INSTITUTIONAL ARRANGEMENTS 13. TECHNICAL DESIGN CRITERIA	10. REUSE OF TREATED EFFLUENT	8. DEVELOP LAND TREATMENT ALTERNATIVE
IMPACT ANALYSIS VI			9. IMPACT ANALYSIS
SELECTION & IMPLEMENTATION VII		11. SELECTION AND IMPLEMENTATION	
REPORT VIII		12. REPORT PREPARATION	

TASK ASSIGNMENTS

BOSTON HARBOR-EASTERN MASSACHUSETTS METROPOLITAN AREA WASTEWATER MANAGEMENT STUDY

<u>SECT.</u>	<u>SUBJECT</u>	MDC	OSPM	EPA	WPC	MAPC	CofE
I.	SUMMARY	☐✓	✓	✓	✓	✓	■
II.	INTRODUCTION	-	-	-	-	-	-
A.	Background of the Study	☐✓	✓	✓	✓	✓	■
B.	The Study Area	☐✓	✓	✓	✓	✓	■
C.	Organization for the Study	☐✓	✓	✓	✓	✓	
D.	Schedule of the Study	☐✓	✓	✓	✓	✓	■
III.	PURPOSE OF THE STUDY	-	-	-	-	-	-
A.	Purpose	☐✓	✓	✓	✓	✓	■✓
B.	Goals	☐✓	✓	✓	✓	✓	■✓
C.	Objectives	☐✓	✓	✓	✓	✓	■✓
D.	Criteria	☐✓	✓	■✓	■✓	✓	■✓
IV.	PUBLIC PARTICIPATION	-	-	-	-	-	-
A.	Development of the Public Participation Program	■✓	✓	✓	✓	■✓	☐
B.	Public Meetings	■✓	✓	✓	✓	✓	☐
C.	Brochures and Newsletters	■✓	✓	✓	✓	✓	☐
D.	Coordination with the News Media	■✓	✓	✓	✓	✓	☐

KEY: ☐ RESPONSIBLE FOR COORDINATION OF WORK ITEM ✓ PARTICIPATES IN DECISIONS
 ■ MAJOR INPUT INTO WORK ITEM

<u>SECT.</u>	<u>SUBJECT</u>	MDC	OSPM	EPA	WPC	MAPC	CofE
V.	DEVELOPMENT OF BASIC DATA	—	—	—	—	—	—
A.	Demographic & Economic Activity & Land Use	⬢ ✓	✓	✓	✓	■ ✓	✓
	Inside Study Area	⬢ ✓	✓	✓	✓	✓	✓
	Outside Study Area	✓	✓	✓	✓	✓	⬢ ✓
B.	Climatology, Hydrology, Geology & Biota	■ ✓	✓	✓	✓	✓	⬢ ✓
	Inside Study Area	✓	✓	✓	✓	✓	⬢ ✓
	Outside Study Area	✓	✓	✓	✓	✓	⬢ ✓
C.	Industrial Waste Survey	■ ✓	✓	✓	■ ✓	✓	⬢ ✓
D.	Water Use & Consumption, Waste Loads, Sewer System, Infiltration & Existing Treatment Facilities	⬢ ✓	✓	✓	✓	✓	■ ✓
E.	Water Quality	⬢ ✓	✓	✓	■ ✓	✓	■ ✓
VI.	DEVELOPMENT OF ENGINEERING ALTERNATIVES	—	—	—	—	—	—
A.	Develop Range of Treatment Alternatives	⬢ ✓	✓	✓	✓	✓	■ ✓
	1. All Harbor Facilities	⬢ ✓	✓	✓	✓	✓	✓
	2. Satellite Facilities	⬢ ✓	✓	✓	✓	✓	✓
	3. Land Application	✓	✓	✓	✓	✓	⬢ ✓
	4. Combinations	⬢ ✓	✓	✓	✓	✓	⬢ ✓
B.	Sludge Treatment, Reuse and Disposal	⬢ ✓	✓	✓	✓	✓	■ ✓
C.	Reuse of Effluent	■ ✓	✓	✓	✓	✓	⬢ ✓
D.	Operation & Maintenance Requirements	⬢ ✓	✓	✓	✓	✓	■ ✓
E.	Cost Estimates	⬢ ✓	✓	✓	✓	✓	⬢ ✓

<u>SECT.</u>	<u>SUBJECT</u>	MDC	OSFM	EPA	WPC	MAPC	CofE
VII.	COMBINED SEWER OVERFLOWS	—	—	—	—	—	—
A.	Basic Model Applications	☐✓	✓	✓	✓	✓	✓
B.	Design Criteria Selection	☐✓	✓	✓	✓	✓	✓
C.	Model Consolidation & Demonstration	☐✓	✓	✓	✓	✓	✓
D.	Evaluation of Alternatives	☐✓	✓	✓	✓	✓	☐
E.	Personnel Training & Model Installation	☐✓	✓	✓	✓	✓	✓
F.	Unified Control of Pollution Discharges	☐✓	✓	✓	✓	✓	✓
	to the Boston Harbor Drainage Area	—	—	—	—	—	—
VIII.	STORMWATER AND URBAN RUNOFF	—	—	—	—	—	—
A.	Storm Drainage Network	✓	✓	✓	✓	✓	☐
B.	Rainfall & Runoff Characteristics	✓	✓	✓	✓	✓	☐
C.	Stormwater Flows	✓	✓	✓	✓	✓	☐
D.	Effects on Receiving Streams	✓	✓	✓	☐✓	✓	☐
E.	Treatment and Control	✓	✓	✓	✓	✓	☐
IX.	DEVELOPMENT OF INSTITUTIONAL & FINANCIAL ALTERNATIVES	—	—	—	—	—	—
A.	Industrial Waste Ordinance	☐✓	✓	✓	✓	✓	✓
B.	Comparable Operations	☐✓	✓	✓	✓	✓	✓
C.	Goal, Objectives & Purpose of Organization	☐✓	✓	✓	✓	✓	✓

<u>SECT.</u>	<u>SUBJECT</u>	MDC	OSPM	EPA	WPC	MAPC	CofE
D.	Criteria for Organizational Design		✓	✓	✓	✓	✓
E.	Capital and Operating Financial Requirement		✓	✓	✓	✓	✓
F.	Effect of Rate Structures		✓	✓	✓	✓	✓
G.	Impact of Financing Arrangements on Future Organization & Administration		✓	✓	✓	✓	✓
H.	Alternative Organizational Design		✓	✓	✓	✓	✓
I.	Recommended Organizational Structure		✓	✓	✓	✓	✓
J.	Recommended Financing and Rates		✓	✓	✓	✓	✓
X.	IMPACT ANALYSIS AND EVALUATION	—	—	—	—	—	—
A.	Social	✓	✓	✓	✓	✓	
B.	Hygiene	✓	✓	✓	✓	✓	
C.	Aesthetics	✓	✓	✓	✓	✓	
D.	Ecology	✓	✓	✓	✓	✓	
E.	Economics	✓	✓	✓	✓	✓	
F.	Institutions	✓	✓	✓	✓	✓	
G.	Evaluation	✓	✓	✓	✓	✓	

<u>SECT.</u>	<u>SUBJECT</u>	MDC	OSPM	EPA	WPC	MAPC	CoFE
XI.	RECOMMENDED PLAN	—	—	—	—	—	—
A.	Plan for the Area	☐✓	✓	✓	✓	✓	☐
B.	Additional Treatment for Deer & Nut Island Flows	☐✓	✓	✓	✓	✓	✓
C.	Treatment & Disposal of Deer & Nut Island Sludges	☐✓	✓	✓	✓	✓	✓
D.	Implementation Plan	☐✓	✓	✓	✓	✓	■
XII.	ENVIRONMENTAL IMPACT REPORT	■✓	✓	✓	✓	✓	☐
XIII.	STUDY MANAGEMENT AND REPORT	—	—	—	—	—	—
A.	Report	☐✓	✓	✓	✓	✓	☐✓
B.	Draft Report Review	☐✓	✓	✓	✓	✓	☐✓
C.	Updating the Report	☐✓	✓	✓	✓	✓	☐✓
D.	Maintain Overall Program Management Procedure	☐✓	✓	✓	✓	✓	☐✓
E.	Maintain Study Schedule	☐✓	✓	✓	✓	✓	☐✓
F.	Manage Costs of Program	☐✓	✓	✓	✓	✓	☐✓
G.	Maintain Working Relationships between Agencies	☐✓	✓	✓	✓	✓	☐✓

<u>SECT.</u>	<u>SUBJECT</u>	MDC	OSPM	EPA	WPC	MAPC	CofE
XIV.	ADDITIONAL STUDIES	—	—	—	—	—	—
A.	Monitoring of System Performance	■ ✓	✓	✓	✓	✓	⬡ ✓
B.	Condition of Boston Harbor	■ ✓	✓	✓	✓	✓	⬡ ✓
C.	Future Uses of Boston Harbor	■ ✓	✓	✓	✓	✓	⬡ ✓
D.	Modeling of Boston Harbor	■ ✓	✓	✓	■	✓	⬡ ✓

CPM OF MDC PROJECT ON WATER QUALITY CONTROL FOR THE EASTERN MASS METROPOL AREA
PART I SCHEDULE REPORT START DATE 03/12/73

PAGE 1

(I)	(J)	DUR	ACTIVITY	DESCRIPTION	***** EARLY *****		***** LATE *****		TOTAL
					START	FINISH	START	FINISH	FLOAT
1	5	5	DEVELOPMENT OF LAND USE GOALS		03/12/73	03/16/73	03/12/73	03/16/73	0
5	10	14	DATA INVENTORY FOR EMPIRIC TOTALS BY MUNICIPALITY		03/19/73	04/05/73	03/19/73	04/05/73	0
5	20	10	1960 & 1970 TRANSPORTATION NETWORKS		03/19/73	03/30/73	04/13/73	04/26/73	19
5	25	10	INVENTORY OF 1960 & 70 WATER & SEWER SERVICE AREAS		03/19/73	03/30/73	04/13/73	04/26/73	19
10	15	5	1970 EMPLOYMENT DATA		04/06/73	04/12/73	04/20/73	04/26/73	10
10	25	15	1960 & 1970 POINT SOURCE		04/06/73	04/26/73	04/06/73	04/26/73	0
10	30	15	INVENTORY OF 1970 LAND USE		04/06/73	04/26/73	05/11/73	06/01/73	25
10	35	10	TOTAL REGIONAL POP. & EMPLOYMENT PROJECTIONS		04/06/73	04/19/73	05/25/73	06/08/73	35
15	25	0	DUMMY		04/13/73	04/13/73	04/27/73	04/27/73	10
20	25	0	DUMMY		04/02/73	04/02/73	04/27/73	04/27/73	19
27	123	79	LATER TASK STARTING DATE	NOT SHOWN ON CPM DIAGRAM	03/12/73	06/29/73	03/15/73	07/05/73	3
25	30	25	CALIBRATION OF EMPIRIC		04/27/73	06/01/73	04/27/73	06/01/73	0
30	35	5	DETERMINATION OF AVAILABLE LAND		06/04/73	06/08/73	06/04/73	06/08/73	0
35	40	5	FUTURE WATER & SEWER SERVICE AREAS		06/11/73	06/15/73	06/11/73	06/15/73	0
35	45	10	FUTURE TRANSPORTATION SYSTEM		06/11/73	06/22/73	06/11/73	06/22/73	0
40	45	5	FUTURE MAJOR CENTERS		06/18/73	06/22/73	06/18/73	06/22/73	0
42	125	100	DATA INVENTORY AND PROJECTIONS		03/12/73	07/31/73	04/20/73	09/11/73	29
45	50	10	DEVELOPMT DENSITY CONSTRAINTS ON FORECASTS AND LAND USE REST		06/25/73	07/09/73	06/25/73	07/09/73	0
50	55	20	EMPIRIC APPLICATION		07/10/73	08/06/73	07/10/73	08/06/73	0
55	60	15	ANALYSIS OF ALTERNATIVES		08/07/73	08/27/73	08/07/73	08/27/73	0
60	125	10	FINALIZATION OF PREFERRED PLAN		08/28/73	09/11/73	08/28/73	09/11/73	0
61	63	15	LATER TASK STARTING DATE	NOT SHOWN ON CPM DIAGRAM	03/12/73	03/30/73	05/02/73	05/22/73	37
63	74	5	NEWS RELEASE DESCRIBING SCOPE PURPOSE AND EFFORT		04/02/73	04/06/73	05/23/73	05/30/73	37
65	70	15	SEWER SYSTEM DATA COLLECTION & ANALYSIS		03/12/73	03/30/73	04/20/73	05/10/73	29
65	75	15	WATER CONSUMPTION DATA & ANALYSIS		03/12/73	03/30/73	04/20/73	05/10/73	29
65	175	30	PROFILE OF OPERATION IN US & CANADA		03/12/73	04/20/73	10/31/73	12/12/73	162
70	75	0	DUMMY		04/02/73	04/02/73	05/11/73	05/11/73	29
72	74	45	LATER TASK STARTING DATE	NOT SHOWN ON CPM DIAGRAM	03/12/73	05/11/73	03/28/73	05/30/73	12
74	125	20	FORUMS DESCRIBING CRITERIA USED		05/14/73	06/11/73	08/14/73	09/11/73	64
74	171	60	QUALITY COMPONENTS AND QUANTITIES		05/14/73	08/07/73	08/10/73	11/06/73	62
74	215	215	ECOLOGICAL AESTHETIC HYGIENIC AND ECONOMIC IMPACT ANALYSIS		05/14/73	03/21/74	05/31/73	04/03/74	12
75	80	20	MODELING OF OVERFLOWS		04/02/73	04/27/73	05/18/73	06/15/73	34
75	85	25	MODELING OF INTERCEPTORS		04/02/73	05/04/73	05/11/73	06/15/73	29
75	90	25	MODELING OF COMBINED SEWERS		04/02/73	05/04/73	05/11/73	06/15/73	29
75	95	10	DEER & NUT ISLANDS SYSTEM & FLOW INVENTORY AND ANALYSIS		04/02/73	04/13/73	07/02/73	07/16/73	64
80	90	0	DUMMY		04/30/73	04/30/73	06/18/73	06/18/73	34
85	90	0	DUMMY		05/07/73	05/07/73	06/18/73	06/18/73	29
90	110	20	DESIGN CRITERIA SELECTION		05/07/73	06/04/73	06/25/73	07/23/73	34
90	120	25	MODELING OF RECEIVING WATERS		05/07/73	06/11/73	06/18/73	07/23/73	29
95	96	15	EXISTING MECHANICAL FACILITIES INSPECTION AND ANALYSIS		04/16/73	05/04/73	08/21/73	09/11/73	89
95	125	40	INFILTRATION MEASUREMENT & ANALYSIS		04/16/73	06/11/73	07/17/73	09/11/73	64
96	125	0	DUMMY		05/07/73	05/07/73	09/12/73	09/12/73	89
110	120	0	DUMMY		06/05/73	06/05/73	07/24/73	07/24/73	34

ANNEX 4

CPM OF MDC PROJECT ON WATER QUALITY CONTROL FOR THE EASTERN MASS METROPOL AREA
 PART I SCHEDULE REPORT START DATE 03/12/73

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(I)	(J)	DUR	ACTIVITY DESCRIPTION	***** EARLY *****		***** LATE *****		TOTAL
				START	FINISH	START	FINISH	FLOAT
120	127	35	MODEL CONSOLIDATION	06/12/73	07/31/73	07/24/73	09/11/73	29
123	150	80	DRAINAGE NETWORK QUALITY AND QUANTITY OF STORMWATER PLANS	07/02/73	10/25/73	07/06/73	10/30/73	3
125	126	10	FEASIBILITY FOR SUBSURFACE DISPOSAL	09/12/73	09/25/73	10/16/73	10/30/73	23
125	127	0	DUMMY	09/12/73	09/12/73	09/12/73	09/12/73	0
125	135	30	UPGRADING OF EXISTING MSD SYSTEMS	09/12/73	10/25/73	09/17/73	10/30/73	3
125	140	30	EXPANSION OR CONTRACTION OF MSD	09/12/73	10/25/73	09/17/73	10/30/73	3
125	145	30	ONE EASTERN MA. WPC DISTRICT	09/12/73	10/25/73	09/17/73	10/30/73	3
125	150	25	SYSTEM NEGLECTING EXISTING FACILITIES	09/12/73	10/17/73	09/24/73	10/30/73	8
125	174	40	FORUMS AND BROCHURE DESCRIBING AVAILABLE OPTION	09/12/73	11/09/73	10/16/73	12/12/73	23
125	175	60	TREATMENT SYSTEMS AND ALTERNATIVE SOLUTION	09/12/73	12/07/73	09/17/73	12/12/73	3
125	240	20	METHODOLOGY FOR PLAN UPDATING	09/12/73	10/10/73	07/25/74	08/21/74	218
126	150	0	DUMMY	09/26/73	09/26/73	10/31/73	10/31/73	23
127	132	15	MODELING OF CHANGES	09/12/73	10/02/73	09/12/73	10/02/73	0
132	175	48	EVALUATION OF ALTERNATIVES	10/03/73	12/12/73	10/03/73	12/12/73	0
135	150	0	DUMMY	10/26/73	10/26/73	10/31/73	10/31/73	3
140	150	0	DUMMY	10/26/73	10/26/73	10/31/73	10/31/73	3
145	150	0	DUMMY	10/26/73	10/26/73	10/31/73	10/31/73	3
150	155	20	WASTEWATER RECLAMATION	10/26/73	11/23/73	10/31/73	11/28/73	3
150	160	20	SLUDGE PROCESSING	10/26/73	11/23/73	10/31/73	11/28/73	3
155	160	0	DUMMY	11/26/73	11/26/73	11/29/73	11/29/73	3
160	175	10	CONSTRUCTION COST ESTIMATES	11/26/73	12/07/73	11/29/73	12/12/73	3
171	172	0	DUMMY	08/08/73	08/08/73	11/07/73	11/07/73	62
171	175	25	TREATMENT REQUIREMENT	08/08/73	09/12/73	11/07/73	12/12/73	62
172	175	25	ESTABLISHMENT OF ORDINANCE	08/08/73	09/12/73	11/07/73	12/12/73	62
174	175	0	DUMMY	11/09/73	11/09/73	12/13/73	12/13/73	23
175	176	0	DUMMY	12/13/73	12/13/73	02/11/74	02/11/74	40
175	180	15	OCEAN OUTFALL ANALYSIS	12/13/73	01/04/74	12/20/73	01/11/74	5
175	185	40	SECONDARY PLANT LAYOUTS	12/13/73	02/08/74	12/13/73	02/08/74	0
175	205	30	DEFINE GOALS & OBJECTIVES FOR ORGANIZATIONAL ENTITY	12/13/73	01/25/74	01/28/74	03/11/74	30
175	210	10	UNIFIED CONTROL OF DISCHARGES	12/13/73	12/27/73	03/26/74	04/08/74	70
175	213	80	PLAN DETAILING COSTS AND INSTITUTIONAL CONSIDERATIONS	12/13/73	04/08/74	12/13/73	04/08/74	0
175	215	30	ESTABLISH BASIS FOR CHARGES	12/13/73	01/25/74	02/26/74	04/08/74	50
175	240	30	MODEL INSTALLATION	12/13/73	01/25/74	07/11/74	08/21/74	145
176	215	40	FORUMS AND BROCHURE DESCRIBING MAJOR THRUST OF PLANS	12/13/73	02/08/74	02/11/74	04/08/74	40
180	190	20	EFFLUENT & SLUDGE DISPOSAL	01/07/74	02/01/74	01/14/74	02/08/74	5
185	190	0	DUMMY	02/11/74	02/11/74	02/11/74	02/11/74	0
190	195	15	PUMP STATION & HARDWORKS IMPROVEMENTS	02/11/74	03/04/74	02/19/74	03/11/74	5
190	200	20	ADVANCE WASTE TREATMENT CONSIDERATION	02/11/74	03/11/74	02/11/74	03/11/74	0
195	200	0	DUMMY	03/05/74	03/05/74	03/12/74	03/12/74	5
200	215	20	COST ESTIMATES	03/12/74	04/08/74	03/12/74	04/08/74	0
205	215	20	ESTABLISH CRITERIA IN EVALUATING ALTERNATIVES	01/28/74	02/25/74	03/12/74	04/08/74	30
210	215	0	DUMMY	12/28/73	12/28/73	04/09/74	04/09/74	70
213	215	0	DUMMY	04/09/74	04/09/74	04/09/74	04/09/74	0
215	220	25	DETERMINE CAPITAL & OPERATING FINANCIAL REQUIREMENTS	04/09/74	05/13/74	04/09/74	05/13/74	0

(I)	(J)	DUR	ACTIVITY DESCRIPTION	***** EARLY *****		***** LATE *****		TOTAL
				START	FINISH	START	FINISH	FLOAT
215	240	75	PREPARE ENVIROMENTAL IMPACT STATEMENT	04/09/74	07/24/74	05/07/74	08/21/74	20
220	225	25	SELECT & COMPUTE EFFECT OF ALTERNATIVE RATE STRUCTURES	05/14/74	06/18/74	05/14/74	06/18/74	0
220	230	30	DEVELOP ALTERNATIVE ORGANIZATIONAL DESIGNS	05/14/74	06/25/74	06/09/74	07/17/74	15
225	230	20	IMPACT OF FINANCIAL STRUCTURE ON USERS	06/19/74	07/17/74	06/19/74	07/17/74	0
230	235	0	DUMMY	07/18/74	07/18/74	07/25/74	07/25/74	5
230	240	25	RECOMMEND SHORT & LONG-RANGE ORGANIZATION	07/18/74	08/21/74	07/18/74	08/21/74	0
235	240	20	RECOMMEND ALTERNATIVE FINANCING & RATE STRUCTURES	07/18/74	08/14/74	07/25/74	08/21/74	5
240	245	15	REPORT	08/22/74	09/12/74	08/22/74	09/12/74	0
240	250	15	FINAL REPORT	08/22/74	09/12/74	08/22/74	09/12/74	0
245	250	0	DUMMY	09/13/74	09/13/74	09/13/74	09/13/74	0
250	255	10	SUMMARY REPORT	09/13/74	09/26/74	09/13/74	09/26/74	0
255	260	20	MEETING AFTER COMPLETION	09/27/74	10/28/74	10/29/74	11/25/74	20
255	400	0	DUMMY	09/27/74	09/27/74	09/27/74	09/27/74	0
400	410	40	PUBLIC MEETINGS ON STUDY FINDINGS	09/27/74	11/25/74	09/27/74	11/25/74	0

CPM OF MDC PROJECT ON WATER QUALITY CONTROL FOR THE EASTERN MASS METROPOL AREA
PART II CRITICAL ACTIVITIES

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(I)	(J)	DUR	ACTIVITY DESCRIPTION	***** EARLY *****		***** LATE *****		TOTAL
				START	FINISH	START	FINISH	FLOAT
1	5	5	DEVELOPMENT OF LAND USE GOALS	03/12/73	03/16/73	03/12/73	03/16/73	0
5	10	14	DATA INVENTORY FOR EMPIRIC TOTALS BY MUNICIPALITY	03/19/73	04/05/73	03/19/73	04/05/73	0
10	25	15	1960 & 1970 POINT SOURCE	04/06/73	04/26/73	04/06/73	04/26/73	0
25	30	25	CALIBRATION OF EMPIRIC	04/27/73	06/01/73	04/27/73	06/01/73	0
30	35	5	DETERMINATION OF AVAILABLE LAND	06/04/73	06/08/73	06/04/73	06/08/73	0
35	40	5	FUTURE WATER & SEWER SERVICE AREAS	06/11/73	06/15/73	06/11/73	06/15/73	0
35	45	10	FUTURE TRANSPORTATION SYSTEM	06/11/73	06/22/73	06/11/73	06/22/73	0
40	45	5	FUTURE MAJOR CENTERS	06/18/73	06/22/73	06/18/73	06/22/73	0
45	50	10	DEVELOPMENT DENSITY CONSTRAINTS ON FORECASTS AND LAND USE REST	06/25/73	07/09/73	06/25/73	07/09/73	0
50	55	20	EMPIRIC APPLICATION	07/10/73	08/06/73	07/10/73	08/06/73	0
55	60	15	ANALYSIS OF ALTERNATIVES	08/07/73	08/27/73	08/07/73	08/27/73	0
60	125	10	FINALIZATION OF PREFERRED PLAN	08/28/73	09/11/73	08/28/73	09/11/73	0
125	127	0	DUMMY	09/12/73	09/12/73	09/12/73	09/12/73	0
127	132	15	MODELING OF CHANGES	09/12/73	10/02/73	09/12/73	10/02/73	0
132	175	48	EVALUATION OF ALTERNATIVES	10/03/73	12/12/73	10/03/73	12/12/73	0
175	185	40	SECONDARY PLANT LAYOUTS	12/13/73	02/08/74	12/13/73	02/08/74	0
175	213	80	PLAN DETAILING COSTS AND INSTITUTIONAL CONSIDERATIONS	12/13/73	04/08/74	12/13/73	04/08/74	0
185	190	0	DUMMY	02/11/74	02/11/74	02/11/74	02/11/74	0
190	200	20	ADVANCE WASTE TREATMENT CONSIDERATION	02/11/74	03/11/74	02/11/74	03/11/74	0
200	215	20	COST ESTIMATES	03/12/74	04/08/74	03/12/74	04/08/74	0
213	215	0	DUMMY	04/09/74	04/09/74	04/09/74	04/09/74	0
215	220	25	DETERMINE CAPITAL & OPERATING FINANCIAL REQUIREMENTS	04/09/74	05/13/74	04/09/74	05/13/74	0
220	225	25	SELECT & COMPUTE EFFECT OF ALTERNATIVE RATE STRUCTURES	05/14/74	06/18/74	05/14/74	06/18/74	0
225	230	20	IMPACT OF FINANCIAL STRUCTURE ON USERS	06/19/74	07/17/74	06/19/74	07/17/74	0
230	240	25	RECOMMEND SHORT & LONG-RANGE ORGANIZATION	07/18/74	08/21/74	07/18/74	08/21/74	0
240	245	15	REPORT	08/22/74	09/12/74	08/22/74	09/12/74	0
240	250	15	FINAL REPORT	08/22/74	09/12/74	08/22/74	09/12/74	0
245	250	0	DUMMY	09/13/74	09/13/74	09/13/74	09/13/74	0
250	255	10	SUMMARY REPORT	09/13/74	09/26/74	09/13/74	09/26/74	0
255	400	0	DUMMY	09/27/74	09/27/74	09/27/74	09/27/74	0
400	410	40	PUBLIC MEETINGS ON STUDY FINDINGS	09/27/74	11/25/74	09/27/74	11/25/74	0

**** PROJECT DURATION 432

ESTIMATED COSTS
for the
BOSTON HARBOR-EASTERN MASSACHUSETTS METROPOLITAN AREA
WASTEWATER MANAGEMENT STUDY
by
WORK TASKS

PHASE I

<u>Work Tasks</u>	<u>Estimated Cost</u>
<u>a. By Metropolitan District Commission</u>	
(1) Development of Engineering Background	\$183,000
(2) Establishing limits and systems for Boston Harbor-Eastern Massachusetts Area	118,000
(3) Preliminary Plans for Additional Treatment at Deer and Nut Islands	78,000
(4) Operation and Regulation of Sewage Inter- ceptors and Overflows	140,000
(5) Industrial Waste Ordinance	27,000
(6) MDC Management Study	128,000
(7) Program and Final Report Sub-Total (M&E Contract effort)	<u>60,000</u>
	\$734,000
(8) Development of Basic Data (by Metropolitan Area Planning Council)	\$ 33,600
(9) Sludge Disposal Study (by Havens and Emerson, Ltd. contract)	<u>41,000</u>
TOTAL ESTIMATED STUDY COSTS BY MDC:	\$808,600
 <u>b. By Corps of Engineers</u>	
(1) Public Participation & Information Program	\$100,000
(2) Land Treatment Techniques	175,000
(3) Industrial Survey	125,000
(4) Impact Analysis and Evaluation	150,000

(5) Stormwater, Drainage & Urban Runoff	150,000
(6) Preparation of Environmental Impacts	<u>75,000</u>
TOTAL ESTIMATED STUDY COSTS BY CORPS:	<u>\$775,000</u>
TOTAL ESTIMATED STUDY COSTS FOR PHASE I (MDC & CORPS)	\$1,583,600

PHASE II

<u>Work Tasks</u>	<u>Estimated Cost</u>
a. <u>By Corps of Engineers</u>	
(1) Determining Existing Condition of Boston Harbor	\$300,000
(2) Determining Potential & Alternative Future Uses of Boston Harbor	50,000
(3) Reliability of System Performance	20,000
(4) Study management, report preparation, reproduction, establishing goals and objectives, utilization of sludge with solid waste, forums, coordination with Metropolitan District Commission, etc.	155,000
	<hr/>
TOTAL ESTIMATED STUDY COSTS BY CORPS:	\$525,000

SUMMARY

a. <u>Summary of Total Estimated Study Cost</u>	
Metropolitan District Commission	\$ 775,000
Corps of Engineers	<u>1,300,000</u>
TOTAL ESTIMATED COMBINED STUDY COST:	\$2,075,000

CITIES AND TOWNS WITHIN THE STUDY AREA

MAPC MEMBER COMMUNITIES

19 Cities

Beverly	Melrose
Boston	Newton
Cambridge	Peabody
Chelsea	Quincy
Everett	Revere
Gloucester	Salem
Lynn	Somerville
Malden	Waltham
Marlborough	Woburn
Medford	

80 Towns

Acton	Carlisle	Hingham
Arlington	Cohasset	Holbrook
Ashland	Concord	Holliston
Bedford	Danvers	Hudson
Bellingham	Dedham	Hull
Belmont	Dover	Ipswich
Bolton	Duxbury	Lexington
Boxborough	Essex	Lincoln
Braintree	Framingham	Littleton
Brookline	Franklin	Lynnfield
Burlington	Hamilton	Manchester
Canton	Hanover	Marblehead

80 Towns (cont'd)

Marshfield	Pembroke	Topsfield
Maynard	Randolph	Wakefield
Medfield	Reading	Walpole
Medway	Rockland	Watertown
Middleton	Rockport	Wayland
Milford	Saugus	Wellesley
Millis	Scituate	Wenham
Milton	Sharon	Weston
Nahant	Sherborn	Westwood
Natick	Southborough	Weymouth
Needham	Stoneham	Wilmington
Norfolk	Stoughton	Winchester
North Reading	Stow	Winthrop
Norwell	Sudbury	Wrentham
Norwood	Swampscott	

ADDITIONAL COMMUNITIES

Avon	Hopkinton
Berlin	Northborough
Billerica	Tewksbury
Boxford	Westborough
Chelmsford	Westford

EDMUND S. MUSKIE, MAINE
 R. EVERETT L. CLARK, N.C.
 BIRCH BAYNE, IND.
 JOSEPH W. MCCLUGA, N. MEX.
 THOMAS F. EAGLETON, MO.
 MIKE GRAVEL, ALASKA
 HENRY V. TURNER, CALIF.
 LLOYD BENTSEN, TEX.

JOHN SHERMAN COOPER, KY.
 J. CALVIN COOPER, D.C.
 HOWARD H. BAKER, JR., ILL.
 FORREST GALT, KANS.
 JAMES L. BUCKLEY, N.Y.
 ROBERT T. STAFFORD, VT.
 KARL E. MUNDT, S. DAK.

M. BARRY MEYER, CHIEF COUNSEL AND CHIEF CLERK
 BAILEY GUARD, MINORITY CLERK

United States Senate

COMMITTEE ON PUBLIC WORKS
 WASHINGTON, D.C. 20510

March 2, 1972

Chief of Engineers
 Office, Chief of Engineers
 Department of the Army
 Washington, D. C.

Dear Sir:

Enclosed are original and four copies of a resolution adopted this date by the Committee on Public Works, requesting the Secretary of the Army, acting through the Chief of Engineers, prepare plans to meet the long-range water needs of the northeastern United States as authorized by Section 101 of Public Law 89-298, to cooperate with the Commonwealth of Massachusetts in conducting a joint study to recommend improvements in wastewater management and alternatives thereto for that portion of the Merrimack Basin and tributaries within the Commonwealth of Massachusetts and the Boston Metropolitan area.

I am authorized and directed by the Committee on Public Works to transmit this resolution to you for appropriate action thereon.

Truly,

Jennings

Jennings Randolph
 Chairman

Enclosures (5)

ATTACHMENT NO. 1

United States Senate

COMMITTEE ON PUBLIC WORKS

COMMITTEE RESOLUTION

RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE,

That the Secretary of the Army, acting through the Chief of Engineers, is hereby authorized, in connection with the preparation of plans to meet the long-range water needs of the northeastern United States as authorized by Section 101 of Public Law 89-298, to cooperate with the Commonwealth of Massachusetts in conducting a joint study to recommend improvements in wastewater management and alternatives thereto for that portion of the Merrimack Basin and tributaries thereto within the Commonwealth of Massachusetts and the Boston Metropolitan area. The scope of such study shall be established with the consultation of the Commonwealth of Massachusetts and the Environmental Protection Agency and shall include measures for wastewater management including cleanup and restoration in the interest of water supply, environmental quality, recreation and fish and wildlife and shall incorporate the overall water resources and wastewater management implementation program previously determined by the Commonwealth of Massachusetts and approved by the Environmental Protection Agency. In order to avoid duplication of effort and expense, as well as to provide the orderly implementation of the studies and investigations authorized by this resolution, the Corps of Engineers is hereby directed to use the findings and recommendations of

JOHN A. BLATNIK, MINN., CHAIRMAN

ALBY E. JONES, ALA.
 CARL M. MUCKYNSHI, ILL.
 DIT, TEX.
 H. J. GRAY, ILL.
 ANNE M. CLARK, PA.
 EDMONDSON, ORLA.
 GOLD T. JOHNSON, CALIF.
 J. BRYAN EDEN, S.C.
 WID N. HENDERSON, N.C.
 Y. ROBERTS, TEN.
 VES KEE, W. VA.
 VOR J. HOWARD, N.J.
 FENN M. ANDERSON, CALIF.
 TRICK T. CAPEREN, I.A.
 GERT A. ROE, N.J.
 ORGE W. COLLINS, ILL.
 NO RONCALIO, WYO.
 OK BEGICH, ALASKA
 KE MCCORMACK, WASH.
 JAMES B. BANGS, N.Y.
 MEO V. STANTON, OHIO
 ILLA ARZUG, N.Y.

WILLIAM H. HARGIS, OHIO
 JAMES H. O'DOVER, JR., N.Y.
 JAMES C. CLEVELAND, ILL.
 DON H. CLAYSON, CALIF.
 FRED EDWARDS, IDAHO
 M. G. (GARY) SHYDER, NY.
 ROGER H. TION, IND.
 JACK W. MCGRAND, MICH.
 JOSEPH L. HEMMERSCHMIDT, ARK.
 CHARLES F. MILLER, OHIO
 WILMER D. MITCHELL, N.C.
 JOHN H. TERRY, N.Y.
 CHARLES THORNTON, NEBR.
 LAMAR BAKER, TEXAS.

RICHARD T. FULFORD, CHIEF COUNSEL
 LLOYD A. RIVARD, ENGINEER CONSULTANT
 LESTER ECKHART, COUNSEL
 CARL H. EDWARDS, JR., CONSULTANT—
 PROJECTS AND PROGRAMS
 CLIFTON W. ENFIELD, MINORITY COUNSEL
 JAMES L. COHENSTADT, ADMINISTRATOR

Committee on Public Works

Congress of the United States

House of Representatives

Room 2165, Rayburn House Office Building
 Washington, D.C. 20515

TELEPHONE: AREA CODE 202, 223-4472

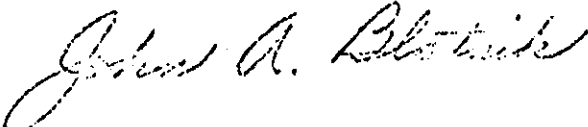
June 16, 1972

Chief of Engineers
 Department of the Army
 Washington, D. C. 20315

Dear Sir:

Enclosed is a resolution adopted by the
 Committee on Public Works directing the Corps
 of Engineers to proceed with a review investi-

gation of the Merrimack River Basin and Tribu-
 taries within Commonwealth of Massachusetts and
 Boston Metro. Area
 (Docket #1869).

Sincerely yours,


John A. Blatnik, M. C.
 Chairman
 Committee on Public Works

COMMITTEE ON PUBLIC WORKS
HOUSE OF REPRESENTATIVES, U.S.
WASHINGTON, D.C. 20515

R E S O L U T I O N

Resolved by the Committee on Public Works of the House of Representatives, United States, That the Secretary of the Army, acting through the Chief of Engineers, is hereby requested, in connection with the preparation of plans to meet the long-range water needs of the northeastern United States as authorized by section 101 of Public Law 89-298, to cooperate with the Commonwealth of Massachusetts in conducting a joint study to recommend improvements in wastewater management and alternatives thereto for that portion of the Merrimack Basin and tributaries thereto within the Commonwealth of Massachusetts and the Boston metropolitan area. The scope of such study shall be established with the consultation of the Commonwealth of Massachusetts and the Environmental Protection Agency and shall include measures for wastewater management including cleanup and restoration in the interest of water supply, environmental quality, recreation, and fish and wildlife and shall incorporate the overall water resources

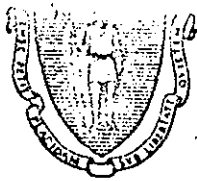
Adopted June 14, 1972

Attest: _____

John A. Blatnik, M. C.
Chairman

Requested by: Hon. Michael J. Harrington

and wastewater management implementation program previously determined by the Commonwealth of Massachusetts and approved by the Environmental Protection Agency. In order to avoid duplication of effort and expense, as well as to provide the orderly implementation of the studies and investigations authorized by this resolution, the Corps of Engineers is hereby directed to use the findings and recommendations of the New Hampshire Water Supply and Pollution Control Commission as published in the Commission's report titled "Merrimack River Basin Plan," February, 1972, and any amendments thereto, as the sole basis for the Corps' recommendations relating to the New Hampshire portion of the Merrimack River Basin.



CHARLES H. W. FOSTER
Secretary

The Commonwealth of Massachusetts

Executive Office of Environmental Affairs

18 Tremont Street

Boston, Massachusetts 02108

November 27, 1972

Major General R. H. Groves
Division Engineer
North Atlantic Division, Corps of Engineers
Department of the Army
90 Church Street
New York, N.Y. 10007

Dear General Groves:

Enclosed you will find a signed agreement between the Department of the Army, Corps of Engineers, and the Commonwealth of Massachusetts with respect to the Merrimack River Basin and the Boston Metropolitan Region.

I have been especially pleased with the cooperative working relationships which have been established between the Corps, the involved regional planning agencies, and various agencies of the Commonwealth. This joint effort should result in a waste water management plan of which we all can be proud.

You should note that the concluding paragraph of the agreement calling for an integrated planning effort will be the subject of an appendix document specifying the procedures to be followed. This will be forwarded to the appropriate office of the Corps as designated by you for signature. It should be regarded as an integral part of the agreement.

I am apologetic for the delay in completing our formal agreement, but the delay should not be construed as a lack of enthusiasm on the Commonwealth's part. The simultaneous planning programs relating to the Nashua, Southeastern New England, the Metropolitan District Commission, regional planning agencies, and the overall water quality planning project submitted to the Environmental Protection Agency made it essential that the total effort be coordinated at the outset. With the assistance of your office, this has now taken place.

Most sincerely yours,

Charles H. W. Foster
Secretary

CHWF:hw
enc.

ATTACH. NO. 3

AGREEMENT BETWEEN THE DEPARTMENT OF THE ARMY,
CORPS OF ENGINEERS AND THE COMMONWEALTH OF MASSACHUSETTS

The Department of the Army, Corps of Engineers and the Commonwealth of Massachusetts agree to undertake jointly, a planning effort for wastewater management as specified herein, conditioned upon Congressional approval and appropriation of funds.

The Corps' portion of the effort will be conducted under the authority of its Northeastern United States Water Supply study, subject to qualification by subsequent Congressional resolution.

The study area will consist of the Massachusetts' portion of the Merrimack River basin, with expansion to the Boston Metropolitan area.

The wastewater plan will aim at thorough elimination of pollutants through the use of both basic and advanced treatment and disposal techniques and other approaches. The river basin planning requirements of the Federal Environmental Protection Agency and the definitely committed portions of the Commonwealth pollution abatement program will be basic to and incorporated in the development of this wastewater plan. The EPA requirements are specified in "Guidelines for Water Quality Management" as required by sections 18 CFR 601.32 and 18 CFR 601.33 of the Federal Register, adopted 2 July 1970. The definitely committed portions of the Commonwealth program are taken to mean those pollution abatement facilities either under construction or listed in the now current implementation program of the commonwealth.

Major work items for plan development will be:

- a. An evaluation of the aim to achieve maximum water quality.
- b. An evaluation of institutional alternatives appropriate for implementing the wastewater plan.
- c. An evaluation of cost sharing alternatives appropriate to the wastewater plan.
- d. Formulation of a total wastewater management system for the study area.
- e. Detailed planning of a limited number of system projects.


These will be projects in addition to those currently under design as part of the Commonwealth's implementation program.

Development of the wastewater plan will be broadly coordinated with the planning functions of other Federal, State and local agencies and groups operating within the study area, with particular reference to the New England River Basins Commission.

Public involvement in plan development will be sought through an open planning process. Guidelines for this process are contained in "Open Planning/The Merrimack," September 1971, a report prepared for the Corps of Engineers by the New England Natural Resources Center.

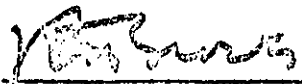
The planning effort will be conducted as a single operation, composed of both Federal and State personnel, having an integrated Federal-State decision process, and resulting in a joint report. A plan of study document describing the scope and specifics of the work to be undertaken will be prepared once the management decision process for the effort has been formulated. The wastewater planning effort will be completed in twelve to eighteen months after a plan of study is completed and accepted. The specific time schedule will depend upon the extent of Congressional directive, the amount of funds appropriated and the detailed scope of work.

For The Commonwealth of Massachusetts: For the Corps of Engineers:



Secretary
Executive Office of Environmental
Affairs

Date: November 27, 1972



R. H. GROVES
Major General, USA
Division Engineer
North Atlantic Division

Date: 18 July 1972

AGREEMENT

This Agreement made as of May 24, 1972 by and between the Federal Environmental Protection Agency ("EPA") and the Commonwealth of Massachusetts, including the executive agencies thereof as are signators hereto ("Commonwealth");

W I T N E S S E T H

WHEREAS, the EPA and the Commonwealth desire to enhance the water quality of the metropolitan Boston region, including Boston Harbor, by the construction of sewers, other waste disposal facilities and waste treatment works which will be eligible for HUD, EDA and EPA financial assistance;

NOW, THEREFORE, the parties hereto mutually agree as follows, subject to Commonwealth legislative authorization and the availability of federal and state funds:

1. The Commonwealth hereby agrees to meet, within the time period set forth herein, the provisions of federal regulation Title 18 C.F.R. §601.25(b) dated July 8, 1971 for all wastes discharged from the MDC treatment plants.

2. The Commonwealth agrees to promptly seek funds for comprehensive engineering and management studies, to be undertaken at its own expense and with such federal assistance as may be available, the scope of such studies to be submitted to EPA for review and comment. The engineering study shall determine the most feasible means of achieving a minimum of secondary treatment as defined in federal regulation Title 18 C.F.R. §601.25(b), within the time periods set forth below, which study shall consider and evaluate various alternatives for providing such treatment, including land disposal, and recommend likely courses of action, including locations and capacities for any new plants, estimated costs of the various alternatives considered and

methods of financing. The firm conducting the engineering study shall consider other studies relating to the disposal of wastes in the MDC system and shall cooperate with any parties who may be conducting related studies in the Boston metropolitan area. The management study shall develop management recommendations for a comprehensive waste management program for the metropolitan Boston region, including (1) possible expansion of the region; changes in structure; revisions in rate structure; charges for waste treatment; and methods of capital financing and (2) consideration of associated waste water reclamation for such purposes as maintenance of minimum flow in streams throughout the metropolitan Boston area.

3. For the purpose of satisfying its obligations contained in paragraphs 1 and 2 hereof, the Commonwealth agrees to the following dates for the work to be accomplished:

August 1, 1972 - Commonwealth to commit sufficient funds to conduct the engineering and management studies referred to in paragraph 2 above;

October 1, 1972 - execute contract with a nationally known professional engineering consulting firm to conduct said engineering and management studies;

November 1, 1972 - April 1, 1974 - Commonwealth to forward interim progress reports to EPA with respect to said engineering and management studies and make copies of any preliminary reports of the engineering firm available to EPA;

April 1, 1974 - complete engineering and management studies and deliver copies to EPA for review;

July 1, 1974 - complete EPA and Commonwealth analysis of said engineering study, adopt action plan, including detailed schedule for constructing the necessary facilities to provide a minimum of secondary treatment for all wastes discharged from the MDC treatment plants;

August 1, 1974 - Commonwealth to commit sufficient funds to prepare engineering design and construction plans of the necessary facilities;

January 1, 1976 - complete engineering design and construction plans and specifications for the facilities to provide a minimum of secondary treatment for all wastes discharged from the MDC treatment plants;

March 1, 1976 - Commonwealth to commit sufficient capital funds to construct the necessary facilities;

May 1, 1976 - commence construction of the initial projects, including constructing facilities to provide a minimum of secondary treatment for all wastes discharged from the MDC's Deer and Nut Island plants, except that if the MDC has determined, and notified EPA in writing of such determination prior to January 1, 1976, to abandon the Deer and/or Nut Island plants prior to December 31, 1980, such facilities need not be constructed with respect to such plant or plants;

May 1, 1979 - completion of initial projects, including constructing facilities to provide a minimum of secondary treatment for all wastes discharged from the MDC's Deer and Nut Island plants, subject to the exception in the immediately preceding item;

December 31, 1980 - completion of construction and achievement of full operation of all other new or expanded plants so as to provide a minimum of secondary treatment for all wastes discharged from the MDC treatment plants.

The work provided for in this paragraph shall be continuously monitored until all of said work has been completed by a technical advisory committee to be established by the Commonwealth, one member of which shall at all times be a representative of EPA as appointed by the Regional Administrator.

4. The Commonwealth agrees to eliminate all floatable and settleable materials from the sewage and industrial wastes (herein called "sludge")

discharged into the Boston Harbor area through the MDC treatment plants within the shortest possible time, but no later than May 1, 1976. For the purpose of satisfying its obligation contained in this paragraph, the Commonwealth agrees to the following dates for the work to be accomplished:

August 1, 1972 - Commonwealth to commit sufficient funds to (1) conduct a preliminary design study by a nationally known professional engineering consulting firm to consider three alternative methods of sludge disposal; namely, incineration, wet oxidation and land disposal, (2) prepare engineering design plans and specifications for construction of sludge disposal facilities and (3) construct said facilities;

August 1, 1972 - MDC to execute contract with said engineering firm for said study and Commonwealth to authorize said engineering firm to proceed with the work called for under the contract;

September 1, 1972 - February 1, 1973 - Commonwealth to forward interim progress reports to EPA with respect to the engineering study and make copies of any preliminary reports of the engineering firm available to EPA;

March 1, 1973 - completion of preliminary engineering study and delivery of report to MDC, with copies to EPA;

June 1, 1973 - completion of review of said report by MDC, the Commonwealth and EPA and approval by said parties of specific plan for construction of sludge disposal facilities;

July 1, 1974 - completion of engineering design plans and specifications for construction of sludge disposal facilities;

September 1, 1974 - approvals by MDC, the Commonwealth and EPA of said plans and specifications;

November 1, 1974 - award of contract for construction of sludge disposal facilities;

May 1, 1976 - completion of construction and achievement of full operation of sludge disposal facilities to eliminate the discharge of all sludge into the Boston Harbor area.

5. The Commonwealth will re-evaluate its project priority system in light of its commitments and agreements made herein. EPA will participate with the Commonwealth in establishing said new priority program, which will include the Boston Harbor area as a high priority project. In order to enable EPA to effectively participate in said re-evaluation, the Commonwealth will provide EPA with all financial data and data regarding water pollution control needs of the Commonwealth.

6. EPA agrees that it will provide all possible financial and technical assistance and will provide conditional certification of adequacy for HUD grants to the Town of Canton and such other municipalities in the MDC jurisdiction as may require such certification for HUD or EDA projects, and to conditionally approve EPA grants for projects in the MDC system, so long as (a) Commonwealth legislative authorization is obtained as required, (b) Commonwealth funds are committed in sufficient amount to accomplish the work described in paragraphs 3 and 4 hereof and (c) the Commonwealth shall otherwise comply with the terms of this Agreement.

7. EPA agrees to explore the eligibility of the MDC for reimbursements for past waste disposal projects under the provisions of applicable federal legislation.

8. This Agreement is entered into in view of all existing applicable State and Federal water quality laws and regulations and shall not be construed as altering or superceding in any manner any proceedings thereunder or requirements imposed thereby.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed by their duly authorized officials as of the date and year first appearing herein.

Commonwealth of Massachusetts
By *Wm. M. 1005*
Secretary of Environmental Affairs

Dated: 7/19/72

Environmental Protection Agency
By *John A. Scheraga*
Regional Administrator

Dated: 7/18/72

Metropolitan District Commission
By *John J. ...*
Commissioner
Dated: 7/19/72

Department of Natural Resources
By *W. W. ...*
Commissioner
Dated: 7/19/72

Division of Water Pollution Control
By _____
Director
Dated: _____